STATE OF WASHINGTON
DEPARTMENT OF COMMUNITY,
TRADE AND ECONOMIC DEVELOPMENT

2005 Biennial Energy Report

Issues and Analysis for the Washington State Legislature and Governor

January 2005

Prepared by the Energy Policy Division
Washington State Department of Community, Trade and Economic Development

Juli Wilkerson, Director

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STATE OF WASHINGTON

DEPARTMENT OF COMMUNITY, TRADE AND ECONOMIC DEVELOPMENT

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Message from the Director

The Department of Community, Trade and Economic Development (CTED) is pleased to submit our 2005 Biennial Energy report to the State Legislature and the Governor's Office on selected energy issues of importance to the state.[1] Energy touches every aspect of our society, from families to communities to businesses. That is why energy policy is a integral part of CTED's strategic plan goal to provide a sustainable economy.

In 2004, Washingtonians spent nearly $16 billion for the energy needed to heat and power our homes and businesses, operate our industries, and transport ourselves and our products. Overall, energy expenditures account for more than 6.5 percent of our gross state product

The 2003 Biennial Report departed from earlier versions, by focusing on one major topic – an update of the electricity portions of the 1993 State Energy Strategy. [2] This report returns to our previous approach with a focus on a few key energy topics. These items were chosen because we believe they are particularly timely for consideration by the new governor and members of the 2005 legislature.

This report begins with an overview of some of the main energy events and issues during 2003 and 2004. We then discuss five specific areas in more detail:

- Proposed state standards for 13 energy efficient products,
- Electric utility planning by way of integrated resource planning,
- Trends related to rising prices for petroleum, natural gas, and electricity,
- Greenhouse gas emissions in Washington including a brief review of analytical and stakeholder efforts to reduce those emissions, and
- A summary of the emerging economic development opportunities resulting from production of in-state biofuels, particularly biodiesel.

We look forward to working closely with the legislature, governor's office, and other energy partners to create an economically and environmentally sound energy future for the state of Washington and its citizens. If you have any questions or would like to discuss any of the issues presented in this report, please contact Tony Usibelli, the director of CTED's Energy Policy Division at TonyU@cted.wa.gov or 360.956.2125, or any of the staff identified at the end of this document.

Juli Wilkerson
Director

[1] RCW 43.21.F.045 (h) "No later than December 1, 1982, and by December 1st of each even-numbered year thereafter, prepare and transmit to the governor and the appropriate committees of the legislature a report on the implementation of the state energy strategy and other important energy issues, as appropriate."

[2] Copies of the 1997, 1999, 2001, and 2003 Biennial Energy Report are available at www.cted.wa.gov in the energy publications section.

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THE 2005 BIENNIAL ENERGY REPORT

This document is CTED's biennial report to the governor and legislative energy committees on energy issues of importance to the state.[1] Energy touches every aspect of our modern society. We estimate that in 2004, Washingtonians spent nearly $16 billion for the energy needed to heat and power our homes and businesses, operate our industries, and transport ourselves and our products. Overall, energy expenditures account for more than six and one-half percent of our gross state product

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Energy Issues and Events 2003-2004 Section 1

Over the last two years, energy issues continued to be prominent in the state and region as seemingly endless debate continued on the future structure of our regional electricity system, Washington and the west coast states undertook new policy and legislative actions to mitigate emissions of climate warming greenhouse gases, and we saw the emergence of "clean/smart" energy industry as a potential source of economic development. On the national and international level, energy issues returned to a level of interest not seen for many years. Oil prices rose dramatically, the east coast experienced a major blackout, and Congress continued to struggle with attempts at the first comprehensive national energy legislation in over a decade.

This section summarizes some of the major milestones in federal energy policy, regional electricity issues, energy prices and supply, global warming and greenhouse gas emissions, energy emergency and security issues, and energy and economic development over the last two years.

Federal Energy Policy

U.S. Congress fails to pass comprehensive energy legislation. Likely to reemerge in 2005 Congress

The comprehensive energy bill foundered over drilling in the Alaska National Wildlife Refuge, liability issues related to the fuel oxygenate MTBE and other disagreements. Many of the energy tax incentives found their way into other bills, but the major provisions regarding electricity reliability, electricity restructuring and oil and gas supply remained stalemated. The increased Republican majorities in Congress may improve the prospects of passing an energy bill but many of the stalemates are regional and not partisan, so all predictions should be very guarded. Since the electricity reliability title is universally supported there will be another attempt to pass it separately if the comprehensive bill cannot move. It is also likely that such an attempt will fail, because it is in the interest of many members to hold it hostage to their more narrow interests. If reliability legislation does pass, either separately or as part of a comprehensive bill, it will accelerate the movement among western states for mandatory reliability and adequacy standards discussed in Section 3.

Congress passes some energy tax incentives in late 2004.

Many of the energy tax incentives that were part of the comprehensive energy bill were instead passed as part of several tax bills passed in late 2004. More than two dozen major energy tax provisions were included. The most notable for Washington State include a short-term extension of the wind energy production tax credit through December 2005, support for construction of an Alaska natural gas pipeline, a 50 cent per gallon credit for biodiesel fuels, and renewal of energy performance contracting for federal facilities including military bases. The wind energy production tax credit has been an important incentive for wind projects in Washington. However, Congress will need to extend the credit for a long period – 4 or 5 years – in order to provide a credible incentive for additional projects.

The Federal Energy Regulatory Commission (FERC) continued to push for the development of electric Regional Transmission Organizations (RTOs) but has backed off on efforts to develop a national Standard Market Design (SMD)

In the face of strong regional opposition from the West and South, FERC stepped back in its efforts to create a "one size fits all" uniform national electricity market via a Standard Market Design approach. FERC has continued to push regional electricity markets to adopt RTOs (see below for a summary of those activities in the Northwest) as the new governance structure of electric transmission operation, planning, and new construction. The Washington Utilities and Transportation Commission (UTC) continued as one of the strongest voices for maintaining regional and particularly, state control of utility retail utility operations.

In 2004, FERC Commissioner Sudeen Kelly of New Mexico was confirmed as the first FERC commissioner from the western U.S. in over two decades.

Regional Electricity Issues (covered in part - Section 3)

Northwest Power and Conservation Council 5th Power Plan (Dec 04)

The plan sees a surplus of power for the next few years and no generation resources will be needed until at least 2010. This electricity supply surplus emerged as a result of the decline in aluminum industry production and economic downturn resulting from the west-coast electricity crisis of 2000-2001 and the recent recession. Regional electricity loads fell to their early 1990s levels while many new power plants were built to respond to the apparent power shortages. In the meantime, according to the plan, the region should begin an aggressive program to capture the large amount of cost-effective conservation that is available and to lay the groundwork for building a large amount of wind generation (and relatively small amount of coal-fired generation) that will be needed later. http://www.nwcouncil.org/energy/powerplan/draftplan/default.htm

Long Term resource adequacy still nags

Even though there is a short term regional power surplus, energy planners in the West are worried about their inability to predict future shortfalls. As a result, many of the regional utility and government energy organizations- Power Council, Bonneville Power Administration (BPA), Committee on Region Electric Power Cooperation (CREPC), Western Electricity Coordinating Council (WECC), and Northwest Power Pool - have begun work on how to measure and track resource adequacy. These studies are expected to yield metrics that can be used to develop voluntary or mandatory adequacy standards. http://www.westgov.org/wieb/site/subpages/crepcpage/index.htm

Electric utilities, Power Council, and BPA reach apparent consensus on future of BPA - "don't buy us resources"

After many years of discussions, it appears that a consensus about the future of BPA has emerged. Most regional energy players have concluded that BPA should only sell the output of the federal system (federal hydropower plus the Energy Northwest nuclear

power plant) and all public utilities should be responsible to acquire resources to meet any of their loads in excess of what is allocated to them from BPA. Investor owned utilities would get a financial settlement of their residential exchange rights. BPA is expected to issue its proposal on the "Regional Dialogue: in January, 2005. There will then be a comment period and a formal process ending in a record of decision.

Under the new system, BPA would make new long-term contracts available in 2009 and fully implement the new system in 2011, but there are still several hurdles that will have to be overcome. First, there still is no consensus about how the system would be allocated. Second, there is still disagreement about service to the remaining aluminum smelters. Third, there are lingering lawsuits about the residential exchange, which, depending on their outcome, could undermine that part of the proposal. Fourth, BPA wants assurances that its customers have adequate resources to meet their loads if the BPA obligation to serve them is voluntarily withdrawn. Fifth, there is lingering opposition among some consumer owned utilities and public interest groups.

Transmission organization deliberations continue - small step on phase I of Grid West

A very small step towards the development of a regional transmission organization took place in December 2004 when the Regional Representatives Group (over the objections of Washington State and most public utilities) voted to recommend that the Grid West members adopt developmental and operational by-laws. This action sets in motion a long process that may lead to the formation of an independent transmission operator. However, there are many further check points that may lead to the abandonment of the process. The most contentious issue remains that of FERC jurisdiction.
http://www.rtowest.com/

Energy Prices and Supplies (Section 4)

Over the last five years, and particularly during the past two years, there have been sizable increases in the prices for energy resources in the U.S and Washington State.

Since 1999, average electricity prices have increased by a third, gasoline has increased over fifty percent, and natural gas has doubled. Petroleum and natural gas prices have been driven higher by numerous domestic and international events ranging from hurricanes in the Gulf Coast to rapidly increasing petroleum demand in China and India, to more rapid decline in natural gas well production than originally predicted. Overall, the supply situation for both natural gas and petroleum has and will likely remain tight which is reflected in higher market prices for both commodities.

Electricity prices remained high through 2004, but some moderation begins to emerge.

Electricity price increases are the result of the events around the 2000/2001 West Coast electricity crisis which we described in our 2003 Biennial Report. [3] As noted then, the

[3] Section 4 2003 Biennial Report to the Legislature, www.cted.wa.gov

price impacts varied by utility. While electricity prices have generally stabilized since 2003 it will be several more years before most of the state's utilities fully recover from the earlier price impacts.

Global Warming and Greenhouse Gases (Section 5)

In September 2003, the Washington, Oregon, and California governors formed the West Coast Governors Global Warming Initiative in order to take collective action to reduce greenhouse gas emissions in the region.

In November 2004, the West Coast Governors issued a report of their recommendations for collective action in five areas – electrification at coastal ports and truck stops so diesel engines can be turned off, common actions to increase supplies and markets for renewable energy, state energy code and equipment efficiency standards, coordinated purchase of high efficiency public vehicles, and coordination of technical and scientific research on climate impacts in the west.

In 2004, the Puget Sound Clean Air Agency convened a stakeholder process to develop recommendations for greenhouse gas reductions in the Puget Sound region.

The Puget Sound Clean air agency stakeholders group included representatives from industry (Boeing, Weyerhaeuser, BP), utilities (PSE, Seattle, Tacoma, SnoPUD), non-profits (Sierra Club, Climate Solutions), trade associations, and local governments. The groups report included recommendations for a variety of climate mitigation actions that are applicable to both the Puget Sound region and the state. These include CO2 reductions for light-duty vehicles, electricity efficiency and renewable generation, land use practices, and materials reduction/recycling.
http://www.pscleanair.org/specprog/globclim/

Governor Locke proposed a package of four bills to address greenhouse gas emissions.

The Governor's package includes legislation that would establish statewide greenhouse gas reduction targets along with an inventory and registry; have the state adopt California vehicle emissions standards; establish minimum energy efficiency requirements for 13 products, and set forth requirements for electric utilities to achieve conservation savings and develop renewable resources.

The State of Washington adopted greenhouse gas reduction standards for new power plants (SHB 3141)

New electric power plants, greater than 25 megawatts capacity, are required to mitigate 20% of their total lifetime production of greenhouse gases. With this legislation Washington joined a total of five other states with similar power plant regulation with Washington having the largest reduction requirement of the group. (RCW 80.70 Carbon Dioxide Mitigation)

Russia ratified the Kyoto climate protocol and it will take effect internationally in February 2005.

Ratification of the Kyoto treaty establishes binding legal commitments by those nations who have ratified the treaty to reduce their greenhouse gas emissions. Ratification also means that international trading and clean development mechanisms will be full in force. The United States has not ratified the treaty and has continued to resist efforts at mandatory international agreements to reduce greenhouse gas emissions.

Congress is not likely to ratify the treaty, but has begun to look at proposals for mandatory greenhouse gas emissions reductions, such as the Lieberman-McCain Climate Stewardship Bill. Many U.S. companies, including several large electric utilities, consider mandatory national and international greenhouse gas reduction requirements to be very likely in the future.

Energy Emergency/Security

The East Coast was struck by a major electrical blackout in August, 2003.

The blackout renewed national interest in electricity reliability and adequacy but failed to generate sufficient political momentum to spur federal action on national electricity reliability legislation. The Northwest has not experienced a major regional electricity disruption since August 1996. As a result of that West Coast disruption the region's utilities instituted new procedures to help prevent future occurrences.

Energy infrastructure continues to be an important component of national security planning.

Although there have been some advancements in identifying key critical energy infrastructure local, state, federal and private/public roles and responsibilities still remain muddled. During 2005 CTED will continue to work with private energy companies and the State Military Department, Division of Emergency Management on this critical infrastructure security planning and response.

Energy and Economic Development Opportunities (Covered in part - Section 6)

Washington and the Northwest have begun to recognize the substantial economic development potential available from expansion of the energy efficiency, renewable energy, and advanced electric grid industry.

Several studies were issued over the last few years that have identified the economic development potential available from the expansion of the Northwest's clean/smart energy industries. A 1998 CTED study, *The Next Generation of Energy, The Renewable Energy and Energy Efficiency Industries in Washington State,* already

demonstrated the economic importance of these industries.[4] New studies, entitled *Poised for Profit*, quantified the potential opportunities available in expanding the industry through both domestic and international markets. The studies concluded that the wind, solar, fuel cell, and advanced electric technologies, such as digital relays and distributed generation, were particularly promising. [5]

Biofuels (biodiesel, ethanol, biologically generated methane, biomass) are a focus area for CTED's energy/economic development work.

Washington will have its first biodiesel production company operating by early 2005. King County Metro transit, the Washington State Ferry, and Thurston County's Intercity Transit, among others, are mixing using biodiesel mixtures in their engines. Developers are bring new methane digesters on-line and the prospects for producing ethanol from cellulose (wood and agricultural wastes) rather than corn sources can represent new economic development opportunities for Washington's rural communities (see Section 6).

The state Energy Facility Site Evaluation Council (EFSEC) has two wind project siting applications under review (Kittitas Valley and Wild Horse).

The 2001 legislature extended the authority of EFSEC to include the ability for renewable energy project developers to request that the state conduct the siting review of their proposed project in place of the local siting process.

The State Building Code Council adopted updates to the non-residential energy code in late 2004.

The State Building Code Council voted to update the non-residential energy code resulting in projected energy first year energy savings of more than 10 million kWhs and 100,000 therms of natural gas.[6] These cost effective savings not only help Washington's businesses contain their energy costs, but they also continue to provide new opportunities for Washington firms that provide energy efficient design and product services. These new requirements are scheduled to take effect in July 2005.

Electric Utilities in Washington increase their non-hydro renewable power sales to customers.

Based on 2003 sales data, Washington's electric sold retail customers 313,000 megawatt-hours of wind power, 434,000 megawatt-hours of biomass fueled electricity, and 75,000 megawatt-hours of electricity generated from landfill gas to their retail customers. Separately, voluntary purchases of green power by retail customers increased by 67% in 2004 to 65,000 megawatt-hours. Washington's non-hydropower

[4] The report is available at http://www.cted.wa.gov/energy/archive/ECONWReport/. It concluded that these industry segments represented nearly 4,000 jobs and more than $900 million in annual gross revenue for the state. CTED Energy Policy Division expects to update the study by February or March 2005.
[5] The study, *Poised for Profit II – The Prospects for the Smart Energy Sector in the Pacific Northwest*, is available at www.climatesolutions.org. CTED was one of the funders of these studies.
[6] A detailed description of the measures that the SBCC adopted and their projected energy savings are available at the CTED web site, www.cted.wa.gov in the Energy Policy Division section.

renewable energy sales in 2004 were 885,000 thousand megawatt-hours or one percent of utility retail sales.

CTED Energy Policy publications are at http://cted.wa.gov.

Product Standards for Energy-Efficiency and Economic Development Section 2

Overview

In December 2004, Governor Locke proposed that Washington State establish state energy efficiency standards for thirteen products not covered by the federal standards. If such standards are adopted, businesses and households will realize a total net economic savings of $489 million after fourteen years. These savings are nearly five times the capital budget to refurbish and renovate the legislative capitol building. Manufacturers can produce equipment that has the ability to save households, businesses, local governments and industries money by using natural gas, electricity and water more efficiently. However, because of market anomalies – such as the developer of a building not being the owner or occupant of a building – economical, energy efficient equipment is frequently not specified or purchased. Washington's legislature can join states across the country in enacting minimum efficiency standards that secure energy and water savings as soon as 2007 with financial returns to customers of 30% to over 100%.

The energy efficient products recommended for state standards range from items that seem invisible, such as low-voltage dry-type transformers (those humming, non-descript gray metal boxes frequently located in electrical closets of commercial buildings) to a household item such as torchiere light fixtures. In the first year, the sale of new products in Washington that meet these standards will save annually over 406 million gallons of water, 1.9 million therms of natural gas, and 136 million kilowatt-hours of electricity.

The standards for product efficiency would ensure that all consumers, in urban and rural communities alike, have access to products that save them money within a few weeks or, at most, a few years of purchasing the products. Such standards would also benefit every citizen by reducing the pressures on our energy supplies, water supplies and energy infrastructure. Finally, standards would effectively decrease the health and environmental impacts of energy production by reducing emissions of global warming gases, mercury, nitrogen oxides, and sulfur dioxides.

In 2020, assuming standards had been in place for fourteen years, natural gas savings would equal nearly 3% of our current statewide commercial sector consumption and electricity savings could power over 90,000 homes. By 2014, annual water savings would reach 2 billion gallons - enough water to meet Olympia's current water needs for one year. The estimated cumulative reduction in global warming pollution from 2007 through 2020 is fourteen billion pounds of CO2 - comparable to removing over one million average vehicles off our roads for a year.[1]

[1] Based on an average car traveling 12,000 miles a year, at an average 20.8 mpg, at a gasoline carbon content of 19.6 lb/gal.

Table 1: Economic and Resource Value of Proposed State Energy Efficiency Standards[2]

Products	First Year Energy Savings	2020 Resource Savings	Net Present Value in 2020	Pay Back Period
	mWhs or thousand therms	mWhs or thousand therms	Millions $ 2004	Years
Commercial Ice-Makers	2,278	20,148	$5.9	1.2
Commercial Clothes Washers			$12.8	2.0
electricity	964	7,972		
natural gas	*160*	*1,280*		
water (gallons)	49,324,000	394,592,000		
Commercial Pre-Rinse Spray Valves			$ 132.6	(1 week)
natural gas	*1,349*	*6,745*		
electricity	10,241	51,205		
water (gallons)	357,000,000	1,785,000,000		
Commercial Refrigerators/Freezers	3,679	33,288	$ 10.6	0.8
Digital Television Adapters	10,950	5,000	$ 17.8	1.2
Illuminated Exit Signs	3,189	44,676	$ 18.2	1.4
Low Voltage Dry-Type Transformers	5,694	79,716	$ 32.7	2.4
Metal Halide Lamp Fixtures	14,892	208,488	$ 73.2	1.7
External Power Supplies	14,016	98,112	$ 30.7	1.9
Reflector Lamps	41,172	80,592	$ 22.1	0.7
Torchiere Lighting Fixtures	28,908	289,080	$110.7	1.0
LED Traffic Signals	876	8,760	$ 1.6	3.5
Commercial Natural Gas Unit Heaters	*400*	*5,445*	$ 20.1	2.6
Total Electricity Savings	136,858	927,037		
Total Natural Gas Savings	*1,909*	*13,470*		
Total Water Savings (gallons)	406,324,000	2,179,592,000		
Total Net Present Value in 2020			**$489**	

Note: Average energy rates used for analysis: residential -.062 cents/kWh, 84.5 cents/therm; commercial -.061 cents/kWh, 73.7 cents/therm.

Table 1 lists the products recommended for Washington standards in the proposed legislation. (A description of the products and product photographs are included in the appendix.) The legislation proposes an effective date of January 2007 for all of the energy efficient products except for commercial ice-makers and metal halide lamp fixtures, which have suggested effective dates of January 2008. The savings in 2020 reflect the total savings from all the energy efficient products that are in use in 2020.

In several cases, the average product life is ten years meaning that in fourteen years all, or nearly all, of the inefficient products have been replaced with efficient products that

[2] One measure has an average life of five years and other measurers have average lives of eight to ten years, so the cumulative savings for those measures peak before 2020. This means the first year savings cannot always be multiplied by fourteen to get the total savings in 2020.

meet the standard. It also means that in the economic analysis, the cost of purchasing all of the replacement products over fourteen years have been included in the net present value calculations. The net present value calculation presents the total monetary value of bill savings achieved by the sale of efficient products between 2007 and 2020 minus the total incremental cost of products incurred by purchasers as a result of the standards over the same period expressed in current dollars.

Excluding projections for future commercial sector growth, the annual water savings reach their peak and plateau in 2014 because the two water saving measures have average product lives of five and eight years. The first year energy savings is calculated by multiplying the number of products sold each year that do not currently meet the proposed standard multiplied by the energy savings between current practice and the efficient product. The simple pay back period is calculated by dividing the dollar value of the energy savings by the incremental cost of the efficient product; the simple pay back reflects the amount of time – a week or few years – it takes for the consumer to earn back their initial investment in the more efficient product.

Table 1 outlines the value of the electricity, natural gas, and water savings to the state and to the consumers. The fastest payback is with the pre-rinse spray valves; the business starts saving money after a few weeks of owning the product. The longest payback is three and one-half years for the LED traffic signals that currently represent over 50% of the market in Washington. Table 2 conveys the rate of returns available from buying the efficient products in lieu of the regular products. These rates are extremely competitive, if not unbeatable in our current economy.

Table 2: Internal Rate of Return Analysis

Product	Internal Rate of Return
Commercial Pre-Rinse Spray Valves	8807%
Reflector Lamps	134%
Commercial Refrigerators/Freezers	90%
Torchiere Lighting Fixtures	89%
Commercial Ice-Makers	89%
Digital Television Adapters	73%
Illuminated Exit Signs	68%
Metal Halide Lamp Fixtures	62%
Commercial Clothes Washers	54%
Low Voltage Dry-Type Transformers	44%
External Power Supplies	43%
Commercial Natural Gas Unit Heaters	32%
LED Traffic Signals	31%

These energy efficient products are currently in use in the marketplace and provide the same function and the same service as the less energy efficient models. In some cases, the energy efficient products actually provide an enhanced service. For example, market tests indicate that the front-loading resource efficient washers clean clothes better and result in less wear and tear on clothes. In the case of the torchiere lamp, the standard precludes the use of a very bright, but hot burning halogen bulb. In order to achieve a bright light comparable to a torchiere with a halogen bulb, a consumer would need to purchase a torchiere that fits compact fluorescent bulbs. If a consumer were not seeking the bright, hot light, then any torchiere that holds any standard bulb would still

be available on the market. The added value is that neither of the efficient torchiere lighting fixtures are fire hazards, as is the currently available inefficient halogen torchiere light fixture. Efficient exit signs provide the same level of visibility as the inefficient models and efficient traffic signals have the added benefit, that the green or red lights fade in intensity before burning out – providing some indication to maintenance staff that bulbs need replacing.

Background

California established minimum energy efficiency standards for products in 1972 in response to a state crisis when the electricity use growth exceeded 8% per year. "At this rate electricity use was doubling every 8 to 10 years. In other words every 8 to 10 years the electric utilities in the state had been required to build as much new generating capacity as they had built in all of their previous history."[3] California's legislature struggled with the complexities and challenges of siting the overwhelming number of plants needed to meet such growth - insufficient water supplies for cooling, unknown risks of nuclear power, earthquake fault lines, sacrificing scenic coastal views, etc. At the same time, analysis showed that there were large reserves of cost-effective energy efficiency investments, especially in minimum energy efficiency standards for appliances and improved building energy codes that could reduce those projected growth rates.

California's 1974 legislature enacted, with the approval of Governor Ronald Reagan, the Warren-Alquist Act that established energy policy and planning in the state. This act specifically directed the newly formed California Energy Commission "to adopt appliance energy efficiency standards to reduce the wasteful, uneconomic, inefficient or unnecessary consumption of energy.[4]" The seeds for future federal and state minimum energy efficiency standards for buildings and products were sown thirty years ago with the passage of that California legislation.

The national Energy Policy Conservation Act of 1975 was amended in 1978 directing U.S. Department of Energy to develop minimum energy efficiency standards for appliances that were cost effective and would result in significant energy savings. However, years went by and no standards were developed. Several states, including New York and Florida and others proceeded to establish their own minimum standards absent any federal progress. Likewise, California expanded the standard setting effort it initiated in the early 1970s. Finally, frustrated with addressing multiple state jurisdictions with mixed standards, the manufacturers worked with the states and consumer and efficiency advocates to develop and pass new federal legislation in 1987 that listed technical specifications directly in the bill as well as gave US Department of Energy the mandate to manage future updates to standards.

Currently the U.S. Department of Energy maintains and updates minimum federal energy efficiency standards for over two dozen products. The National Appliance Energy Conservation Act (NAECA) of 1987 passed by Congress and signed into law by President Reagan was the first federal law to direct manufacturers to produce and sell products in the United States that met or exceeded minimum energy efficiency standards. Later, in 1992, Congress adopted and President Bush signed the Energy Policy Act (EPAct) adding standards for more products (Table 3). Collectively,

[3] G. William Pennington, California's Appliance Energy Efficiency Standards, *California Energy Commission*, (December 2003).
[4] CA Public Resources Code Section 25402 c.

standards already in place will save 4.2 quadrillion BTUs of energy in 2020; equivalent to the annual energy use of 23 million US households - or nine times the total number of residential households in Washington.[5]

NAECA's criteria for prescribing new or amended standards are that the standard "…shall be designed to achieve the maximum improvement in energy efficiency which the Secretary [of Energy] determines is technologically feasible and economically justified." The economically justified test determines whether the benefits exceed the burdens by considering comments and analysis that address 1) the economic impact of a standard to manufacturers, 2) the savings in operating costs through the average life of the product, 3) total estimated energy savings, 4) any lessening of the performance of the product, 5) the impact of any lessening of competition (i.e., will any manufacturer discontinue production of appliance and if so, what's the effect), and 6) the need for national energy conservation.[6]

Table 3: Products Subject to Existing Federal Appliance Efficiency Standards[7]

Products Included in the 1987 National Appliance Energy Conservation Act	
Refrigerator-freezers	Clothes washers
Freezers	Clothes dryers
Room air conditioners	Dishwashers
Central Air conditioners & heat pumps	Ranges and ovens
Furnaces and boilers	Pool heaters
Water heaters	Fluorescent lamp ballasts
Direct-fired space heaters	Televisions*
Products Added in the Energy Policy Act of 1992	
Fluorescent lamps	Showerheads
Incandescent reflector lamps	Faucets and aerators
Electric motors (1-200 hp)	Toilets
Commercial packaged air conditioners and heat pumps	Distribution Transformers*
Commercial furnaces and boilers	Small electric motors (<1 hp)
Commercial water heaters	High-intensity discharge lamps*

*Specific standards were not set in the legislation but instead U.S. DOE was instructed to investigate whether standards were technically feasible and economically justified and to set standards where these criteria were met.

Minimum federal energy efficiency standards were developed as a means to:

- Minimize the effect of market anomalies, outlined more thoroughly below,
- Capture cost-effective energy reductions that benefit consumers financially through direct energy savings,
- Benefit ratepayers with the overall lower cost of energy service,
- Benefit power systems by reducing the demand on existing energy supplies and energy infrastructure, and
- Benefit US residents and the environment by reducing the emissions of sulfur dioxides, mercury, nitrogen oxides, and global warming from fossil fuel power plants.

[5] Andrew deLaski, Jim Kleisch, Toru Kubo, and Steve Nadel, *Leading theWay: Continued Opportunities for New State Appliance and Equipment Efficiency Standards*, ACEEE, (Draft December 2004): 7.
[6] Public Law 100-12 – Mar. 17, 1987, 101 Stat. 103, National Appliance Energy Conservation Act of 1987.
[7] DeLaski et al., *Leading the Way,* 2.

Why State Standards?

The U.S. Department of Energy has established minimum standards for a wide variety of products as outlined in Table 3. The agency has tried to maintain and update those standards, but has often done a poor job of capturing much of the additional cost effective opportunities. U.S. DOE is frequently years behind statutory required implementation of any given standard indicating a lack of resources and/or authority for rulemaking on additional products.[8] Consequently, Washington citizens are paying unnecessary energy and environmental costs for many products. Consumers here in Washington are paying twice because of the energy inefficiencies of products. Each month they are paying higher operating costs associated with these products and they are paying because the cost of energy service increases as power providers need to expand transmission and distribution lines and natural gas pipelines and secure additional, more expensive energy supplies. Not only do purchasers collectively realize a net present value of $488 million in 2020 from the proposed 13 standards, but also the energy savings reduce demand on our energy systems by over 13 million therms of natural gas and 925,000 megawatt-hours of electricity.

The Northwest Power and Conservation Council describes an Action Plan in its 5th Power Plan to "help secure an adequate, affordable, economical, and reliable power system." Recognizing the value of economic and energy resource benefits of efficient products, the Council addresses state standards in its Conservation Action #6.

> "Revise and adopt state and federal energy codes and efficiency standards that capture all regionally cost-effective savings. Specifically, the states should adopt efficiency standards identified in this power plan for appliances and equipment not pre-empted by federal law including, but not limited to, commercial refrigerators, freezers, icemakers, power transformers, and AC/DC power converters."[9]

Why not let the market work? Because markets can have anomalies that result in sub optimal purchasing practices. The economic, health, and environmental values of many energy efficient products are not recognized in the consumer, distribution, and supplier market chain. As evidenced by California – the state experienced a doubling of its power needs over an eight to ten year period absent meaningful market response.

The reasons that the demand side of markets for energy efficient products can malfunction are numerous. The easiest market failure to observe is general lack of awareness. Purchasers may not understand that variations in products exist (not all products have labels), they can misjudge the amount of energy consumed and consequently miss the potential for energy savings from better products, and they are frequently not familiar with the associated environmental impacts of energy production.

One of the most persistent market failures to overcome is when purchases of energy consuming products involve third party decision makers and the entity designing or owning the building or product is the not the same entity that is paying the energy bills. An example is a commercial developer who hires design engineers to provide specifications for a building that the developer will either sell or lease. The lessee will

[8] USDOE has missed deadlines for about 20 products for which it is legally require to review and issue new standards if technically feasible and economically justified. DeLaski and others, *Leading the Way*.
[9] "Fifth Pacific Northwest Electric Power and Conservation Plan," *Northwest Power and Conservation Council* (December Draft 2004), AP-4.

pay the utility bills, but several decisions upstream from the lessee is the design engineer who, for example, specifies inefficient low-voltage transformers through which the power for the entire building will flow, wasting as much as three percent of the building's total electricity consumption. A minimum standard would ensure that the lessee benefited from the installation of the cost-effective energy efficient product. This is also known as a split incentive – the buyer of the product wants to spend the least amount of money on the product because he never pays an energy bill, but the payer of the energy bills may have chosen the higher efficiency product in order to reduce operating costs. This also applies to the residential market with landlords and tenants or spot market builders and homebuyers.

Additionally, some accounting processes focus greater scrutiny on capital costs and less on operating costs. The result is an organization that pays less initially for a product, but ends up paying, year after year in higher energy or water bills. The state encountered this challenge in the construction of new schools and passed a law with guidelines to ensure that schools are designed and built according to energy life cycle cost analysis, thus helping to ensure the cost of future operating expenses are factored in at the time of budgeting school design and construction.

The challenges facing the product supplier are two-fold. The first is that there is limited space for stocking products. This becomes a Catch-22. If the more efficient product represents a minority of market sales, then distributors and retailers are less likely to stock the efficient products. However, willing buyers cannot purchase the efficient products if they are not available when needed e.g., when your water heater or furnace fail you will buy the products available rather than wait 5-10 days to place an order and receive delivery. Additionally, the manufacturing of most appliances is an extremely cost-competitive industry. There is a general unwillingness to produce a more efficient product without clear knowledge about the market for these products.

What State Standards Can We Adopt?

The federal energy efficiency standards preempt state standards, generally. Therefore, the focus of securing additional financial and energy savings from state standards is directed at products not covered by the federal government. Table 4 provides an overview of products with state energy efficiency standards and identifies the products proposed for minimum standards in Washington. California clearly leads the country in achieving energy efficiency and consequently has the second lowest electricity use per capita in the country.[10] Connecticut and Maryland both adopted state standards legislatively in 2002. The New Jersey Senate passed a state standards bill in December 2004 by a vote of 25-4; the bill now returns to the Assembly, which already passed an earlier version of the bill. These state legislatures are taking action because this was the most affordable approach to capturing cost effective energy savings while simultaneously reducing the strain on their regional electricity transmission systems.

Legislators, state agency staff, and stakeholders across the country are promoting only one standard for each product under consideration by the multiple states in a committed effort to cooperate with manufacturers of these products and reduce any potential costs to the manufacturers or states of implementing these standards.

[10] http://www.energy.ca.gov/electricity/us_percapita_electricity.html, US Per Capita Electricity Use By State in 2000, *Energy Information Administration, USDOE.* (Note: Washington had the eight highest electricity use per capita in 2000.)

Table 4: Products Covered by Adopted State Standards[11]

Product	State Adoption	Washington Legislation
Boilers & central furnaces not federally regulated	CA	
Ceiling fans and ceiling fan lights	MD	
Commercial clothes washers	CA, CT, MD	yes
Commercial hot food holding cabinets	CA	
Commercial ice-makers	CA	yes
Commercial natural gas unit heaters	CA, CT, MD	yes
Commercial reach-in refrigerators and freezers	CA, CT, MD	yes
Computer room air conditioners	CA	
Consumer audio and video equipment	CA	
Digital television adaptors	CA	yes
Duct furnaces	CA	
Illuminated Exit signs	CA, CT, MD	yes
External power supplies	CA	yes
Freezers (residential, 30-39 cubic feet)	CA	
General service incandescent lamps	CA*	
Incandescent reflector lamps not federally regulated	CA*	yes
Large commercial packaged AC	CA, CT, MD	
Low-voltage dry-type distribution transformers	CA, CT, MD, OR, MA, MN, NY	yes
Luminaires for metal halide lamps	CA*	yes
Pool heaters not covered by federal standards	CA	
Pool pumps	CA	
Pre-rinse spray valves	CA	yes
Refrigerated beverage vending machines	CA	
Small water heaters not federally regulated	CA	
Torchieres	CA, CT, MD	yes
Traffic signal modules (red and green)	CA, CT, MD	yes
Under-cabinet fluorescent luminaire ballasts	CA	
Walk-in refrigerators & freezers	CA	
Water dispensers	CA	
Water & ground water-source heat pumps	CA	
Wine chillers	CA	

*The California Energy Commission is delaying a vote on product until mid-2005.

Washington's Proposal for State Energy Efficiency Product Standards

The Locke Administration applied the following criteria to select products for inclusion in a bill to establish minimum energy efficiency levels:

- *Rapid financial return to customers.* The fastest consumer payback is a few weeks for the pre-rinse spray valves, while the longest payback for any of the thirteen products is three and one-half years for efficient traffic signals that already represent fifty percent of the market.
- *Multiple manufacturers* are already producing products that meet or exceed these standards. Products meeting these standards represent an estimated 13% to 63% of the national market share, e.g., efficient commercial clothes washers

[11] deLaski et al., *Leading the Way*.

represent 13% of all commercial clothes washer sales and efficient exit signs represent 63% of all exit sign sales. These products are all readily available.

- *California and other states* have adopted an *identical* standard, indicating that a market already exists for the products and that the cost to implement the standard for Washington is lower because of the multi-state adoptions.
- *Existence of benefits in addition to economic and environmental.* The torchiere floor lamp (the light fixtures on stands that shine the light towards the ceiling) standard prevents the use of the hot halogen bulbs that have started more than 290 fires resulting in 25 deaths[12], and water savings from the standards for pre-rinse spray valves and the commercial clothes washers exceed 400 million gallons after one year of product sales.

Because of these stringent criteria, some products that are cost-effective, with a simple payback of five or more years, were still not included in the legislative proposal. Some electric and dual-fuel utilities in Washington include some or nearly all of these thirteen proposed products in their energy efficiency programs supported with ratepayer funds. When an efficient product represents more than 30% of the market it becomes increasingly expensive for the utility to offer rebate programs. Adopting these standards effectively secures this efficiency resource for utilities without any program costs – making standards a lowest-cost investment for ratepayers. The savings still support the utilities in their efforts to meet or reduce load growth and investing in energy efficiency through standards extends the value of our current energy supplies and infrastructure, helping to keep energy bills low.

Manufacturer Availability

Multiple manufacturers currently produce products that can meet or exceed any efficiency standards proposed here. This national availability is summarized here and provided in some detail in the appendix with citation. State standards have been in place for some of these products for years, other state standards are just becoming effective in 2006.

Commercial Ice-makers: Three of the five major manufacturers have virtually complete product lines that qualify; the remaining two major manufacturers have products that qualify in only certain equipment sizes.

Commercial clothes washers: Ten different brands have more than 150 models that qualify, including both top-loading and front-loading designs. Many of these are from two of the market leaders in the commercial laundry sector.

Commercial Pre-rinse spray valves: One of the three major manufacturers produces valves that exceed this standard and delivers it throughout California. A second manufacturer offers improved energy and water efficient valves and recently announced that it will produce a qualifying valve. The third offers products that do not yet qualify.

Commercial refrigerators/freezers: Fifteen manufacturers offer products that meet the solid door standards and seven manufacturers offer products meeting the transparent

[12] See U.S. Consumer Product Safety Commission press release at http://www.cpsc.gov/cpscpub/prerel/prhtml03/03077.html

door standards; these qualifying product sales represent 45% and 22% of market sales, respectively.

Digital television adapters: This product is called for because the Federal Communications Commission has ordered that all over-the-airwaves broadcast TV shift from analog to digital formats as of January 2007. LG and Sylvania currently list qualified digital converters while other manufacturers already market efficient converters in Europe and are expected to offer U.S. products with the 2007 conversion to digital broadcasts.

Exit Signs: Nearly 500 exit signs made by 30 different manufacturers meet this standard today. Installing efficient exit signs in new construction is common practice in Washington.

Low-voltage dry-type distribution transformers: Twenty-five makers of transformers have all or portions of their product line that qualify.

Metal halide lamp fixtures: Approximately 20% of product sales currently meet the standard and six ballast manufacturers make necessary electronic ballasts for metal halide lamps.

External power supplies: There are many manufacturers of efficient power supplies and the technology for all manufacturers to make efficient products is readily available.

Reflector lamps: All major manufacturers and many smaller manufacturers make lamps that comply.

Torchiere lighting fixtures: This standard eliminates the use of the halogen torchiere that typically consumes 300 watts or more of power and is considered a fire hazard. Incandescent torchieres can comply as long as they do not draw more than 190 watts. Approximately 160 compact fluorescent torchieres made by 15 manufacturers are on the market today.

LED traffic signals: Ten manufacturers offer product lines that meet the standards. Approximately one-half of the red and of the green traffic signals in Washington have already been converted to LED signals.

Commercial natural gas unit heaters: About 50% of the unit heaters sold today, including products available from all manufacturers, meet the recommended standard.

References

DeLaski, Andrew, J. Kleisch, T. Kubo, and S. Nadel. "Leading The Way: Continued Opportunities for New State Appliance and Equipment Effiency Standards." American Council for an Energy-Efficient Economy, December 2004.

Pennington, G. William, "California's Appliance Energy Efficiency Standards." California Energy Commission, December 2003.

"Fifth Northwest Power and Conservation Plan." Northwest Power and Conservation Council, December 2004.

California Energy Commission, http://www.energy.ca.gov/electricity/us_percapita_electricity.html, US Per Capita Electricity Use By State in 2000, *Energy Information Administration, USDOE.*

Appendix – Product Information

This appendix includes excerpts from a document based on the latest analysis by the Appliance Standards Awareness Project and the American Council for an Energy Efficient Economy (ACEEE) and the forthcoming ACEEE report "Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards," January 2005. The following are descriptions of each of the products contained in Washington's proposed legislation. It has been reprinted with their permission. For ACEEE's complete report please go to http://www.aceee.org.

Commercial clothes washers

THE PRODUCT: Commercial clothes washers include large institutional style equipment and smaller equipment that is essentially the same as that used in homes. The standard does not address the larger commercial washers. This equipment is used in laundromats and in apartment building laundry rooms.

THE STANDARD: In early 2002, the California Energy Commission (CEC) adopted a minimum energy and water efficiency standard for commercial washers. Maryland and Connecticut enacted this standard in 2004.

KEY FACTS: The recommended energy standard reduces energy use by at least 35% relative to a typical washer sold today. The water use standard reduces the amount of water used by at least 20%, which reduces operating costs and also helps municipalities avert or postpone expensive expansions to their water supplies and wastewater treatment infrastructure. The energy and water savings pay for the additional upfront cost of an efficient washer in two years or less. More than 150 models including both top-loading and front-loading designs are available from ten different brands including many from two of the market leaders in this segment of the commercial laundry machine market.

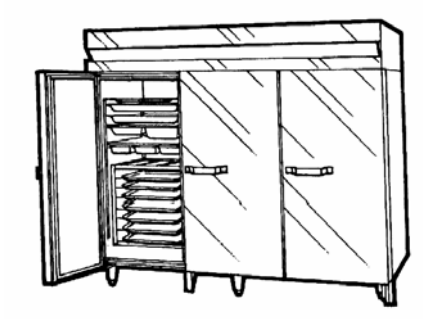
Commercial ice-makers

THE PRODUCT: Commercial ice-makers are commonly used in hotels, motels and restaurants to produce ice in large quantities. Ice-makers use a substantial amount of energy in order to freeze water, and then keep the ice cold.

THE STANDARD: California adopted this state efficiency standard in December 2004 based on the top 20 to 25% most efficient products on the market.

KEY FACTS: Products now on the market vary substantially in efficiency, with the most efficient products typically using about 30% less energy than the least efficient. Products meeting the standard save about 11% relative to the most basic equipment. Three of the five major manufacturers have complete or virtually complete product lines meeting the recommended standard level, while the other two major manufacturers have current products meeting the standard in only certain equipment sizes.

Commercial refrigerators and freezers



THE PRODUCT: Commercial refrigerators and freezers include a wide range of products used in food stores, restaurants, hotels and other commercial and institutional

settings. The proposed standards concern only one, two and three door units that are factory-assembled with all necessary components in a single package and shipped ready for immediate operation. It excludes large supermarket systems, walk-in units and other large site-assembled systems and specialized products used for medical or research applications.

KEY FACTS: Current federal standards cover only residential refrigerators and freezers — as a result a commercial refrigerator uses as much as four times as much energy as a comparably-sized residential unit. The proposed 2004 standard reduces energy use by 28%. About 45% of solid door products and about 22% of transparent door products now being sold meet these standards. Fifteen manufacturers offer products meeting the solid door standards and seven manufacturers offer products meeting the transparent door standards.

Digital television adapters

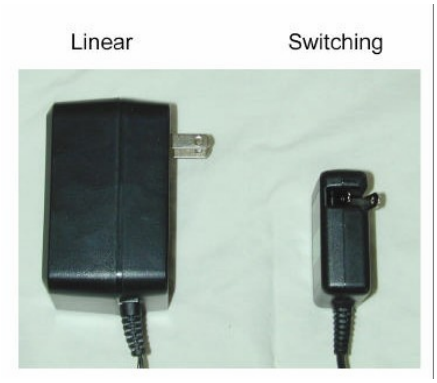
THE PRODUCT: The Federal Communications Commission (FCC) has ordered that all over-the-airwaves broadcast TV shift from analog to digital formats as of January 2007.[13] In order for the tens of millions of analog TVs currently in homes to receive over-the-airwaves broadcasts after January 2007, they will need digital television adapters. Analog TVs hooked up to digital cable systems or satellite systems will not need a converter box separate from their cable or satellite box.

THE STANDARD: In 2003, the European Union developed a voluntary Code of Conduct for digital TV converters that calls for this equipment to use no more than 8 Watts of power in active modes and 1 Watt in standby mode. This is the proposed standard. The Australian government is moving in the same direction.

KEY FACTS: It is estimated that consumers will purchase television adapters for about one in five TVs currently in use between now and 2010. There will be a one-time spike in sales and energy consumption from these products as the FCC order goes into effect in a given market. The recommended standard ensures that this flood of new electronic equipment is relatively efficient by setting a maximum standby energy use level. Because reducing standby energy use requires improved design, rather than more or better materials or more complicated fabrication, we expect the long-term additional cost to make more efficient products will be close to zero. Assuming the additional cost in the near term is about five dollars, the energy bill savings will cover the additional cost for a box in about one year. LG and Sylvania currently list qualified digital converters with ENERGY STAR while other electronics manufacturers already market efficient converters in Europe and are expected to offer U.S. products as the 2007 conversion to digital broadcasts approaches.

[13] While the FCC may move to phase in the digital conversion instead of requiring the entire nation to change over at once in 2007, digital converters will flood the market in the last part of this decade.

External power supplies



THE PRODUCT: External power supplies are the small black boxes typically attached to the power cord of many types of electronic products such as rechargeable tools, telephone answering machines, and laptop computers. Power supplies convert AC supply voltage (around 120 volts in the U.S.) to lower AC or DC voltages that many electronic products operate on. Typically the power supply plugs into an electric outlet and a small cord comes out of the power supply to bring power to the product.

THE STANDARD: The proposed standard includes approximately the top 25% most efficient products on the market.

KEY FACTS: The typical, basic power supply is only 25% to 60% efficient (i.e., 40% to 75% of power is dissipated as heat). Power supplies also generally use several watts of standby power, even when the device being powered is off. Analysis for California has found that the more efficient power supplies have an incremental cost of less than one dollar. There are many manufacturers of efficient power supplies and the technology for all manufacturers to make efficient products is readily available since several companies manufacture the key power supply electronic components.

Illuminated exit signs

THE PRODUCT: Illuminated emergency exit signs are required by fire codes to mark exits in all commercial and institutional buildings. This standard covers all of these signs.

THE STANDARD: The proposed standard is based on the efficiency achieved by light emitting diodes (LEDs). This standard requires that signs have an input power demand of five (5) watts or less per illuminated face.

KEY FACTS: Many exit signs use incandescent bulbs (40 Watts is typical) and, since they are continuously illuminated, typically cost around $30 per year to operate. LED-based exit sign designs consume about three Watts, reducing energy use by more than 90 percent relative to an incandescent sign. Additionally, LED exit signs require less frequent bulb changes resulting in substantial maintenance cost savings. Nearly 500 exit signs made by 30 different manufacturers meet this standard today.

Low voltage dry-type distribution transformers

THE PRODUCT: Distribution transformers reduce electricity voltage from the high levels at which power is shipped over utility transmission and distribution lines to the lower levels required to power appliances, office equipment and building machinery. Utilities own and operate the transformers on their systems including those seen on utility poles and on cement pads throughout utility systems. These utility-owned transformers are typically “liquid-immersed” type equipment. Commercial buildings typically buy power from utilities at higher voltages and own and operate “low-voltage dry-type” transformers to reduce voltages for use with lighting, office equipment and other applications. The recommended standard covers these low-voltage dry-type transformers only.

THE STANDARD: In the late 1990s, the National Electrical Manufacturers Association (NEMA) developed a recommended standard for all major types of distribution transformers, including low-voltage dry-type transformers. NEMA is the trade association for transformer manufacturers. California, Massachusetts, Maryland and Connecticut have adopted the NEMA standard as a mandatory standard and New York, Minnesota and Oregon have incorporated the standard into their building codes.

KEY FACTS: Transformers waste as much as three percent of their energy input as dissipated heat as they reduce voltage to lower levels. Twenty-five makers of transformers have product lines all or portions of which meet the NEMA TP-1 standard.

Metal halide lamp fixtures

THE PRODUCT: Metal halide light fixtures are commonly used in industrial buildings and high-ceiling commercial applications such as gymnasiums and big-box retail stores. Some streetlights and other high-output outdoor applications use metal halide light fixtures.

THE STANDARD: In recent years, a new type of metal halide lamp called “pulse start” lamps have been introduced which use about 15% less energy than the older “probe start” lamps. Pulse start lamps use electronic pulses to start the lamps and do not need to heat a cathode as in probe start lamps.

KEY FACTS: Pulse-start lamps save an average of about 15% and efficient ballasts can cut electricity use by another 11%. Presently, about 20% of metal halide lamp sales are pulse start, primarily in new construction. About 2% of metal halide ballast sales are electronic. All of the major lighting manufacturers and many small manufacturers make pulse start lamps. Six ballast manufacturers make electronic ballasts for metal halide lamps.

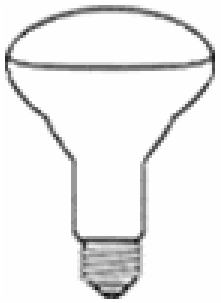
Pre-rinse spray valves

THE PRODUCT: Pre-rinse spray valves are hand held devices used to wash food particles off dishes and flatware, prior to sending them through an automatic dishwasher. They generally use hot water and hence more efficient products save both energy and water.

THE STANDARD: The standard sets a maximum flow rate of 1.6 gallons per minute. This efficiency level has been promoted for several years by California water and energy utilities and qualified products have sold briskly.

KEY FACTS: Due to the large water use by pre-rinse spray valves, California water utilities have been promoting efficient pre-rinse spray valves for several years. Three manufacturers, including most of the major manufacturers, offer very energy and water efficient products.

Reflector lamps



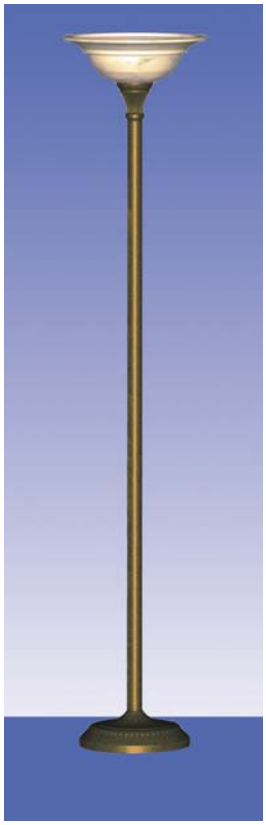
THE PRODUCT: Reflector lamps[14] are the very common cone-shaped light bulbs most typically used in "recessed can" light fixtures.[15] The cone is lined with a reflective coating to direct the light. Bulged reflector (BR) lamps are specific types of reflector lamps that are especially inefficient. Their use has mushroomed in recent years as manufacturers have taken advantage of a loophole in federal standards that exempts BR lamps from federal standards.

THE STANDARD: Under federal law,[16] certain reflector lamps need to meet specified efficacy requirements (e.g., lumens/watt need to exceed specified minimum values). The federal law's intent was to substitute halogen and other more efficient lamp types for the most common type of inefficient reflector lamp known as "R lamps." Elliptical reflector (ER) lamps were exempted because they have a special light distribution that allows lower wattage lamps to be used in recessed fixtures. BR lamps were exempted because one small manufacturer of these lamps said they were "just like" ER lamps and major manufacturers did not produce them. In fact, BR lamps have essentially the same light distribution as R lamps and the market share of these lamps has increased from less than 1% of reflector lamp sales prior to the federal law's passage to about 50% today. The proposed standard closes this loophole by requiring that BR and certain types of ER lamps meet the same efficacy requirements as R lamps.

KEY FACTS: The halogen and other lamp types that substitute for BR lamps generally reduce energy use by more than 10%. The energy bill savings quickly cover the slight additional cost (about $1) of the more efficient lamps. All major manufacturers and many smaller manufacturers make lamps that comply with the standards.

[14] Common lighting industry usage uses the term "lamps" to refer to light bulbs, rather than the light fixture.
[15] Recessed cans are low-cost light fixtures that mount flush with a ceiling such that the socket and bulb are recessed into the ceiling. They are very common in residential and commercial construction.
[16] The Energy Policy Act of 1992 or "EPAct."

Torchiere lighting fixtures



THE PRODUCT: Torchieres are portable lighting fixtures consisting of a base and post that hold a bowl-shaped reflector above eye level and aims light upward, bouncing it off a ceiling to provide indirect lighting. In the 1990s, halogen lamp versions of these fixtures became very common due to their high light levels and low up-front costs. More recently, because of the fire hazard presented by the halogen type lamps, many torchieres have shifted to high output but still use very inefficient incandescent light bulbs.

THE STANDARD: The proposed minimum efficiency standard for torchiere lighting fixtures caps energy use at 190 Watts.

KEY FACTS: These products are major energy hogs, and can be fire hazards as well. According to the U.S. Consumer Product Safety Commission, since 1992, more than 290 fires resulting in 25 deaths have been traced to halogen-bulb torchieres. The typical halogen torchiere lighting fixture consumes 300 Watts or more of power. Much more efficient torchieres based on high-output compact fluorescent designs use less than 100 Watts and can provide the same light output and light quality without creating a fire hazard. About 160 compact fluorescent torchieres made by 15 different manufacturers are on the market today. Incandescent torchieres can also comply with the standard provided they do not draw more than 190 Watts. However, to achieve the high lighting levels generated by 300-Watt halogen lamps, compact fluorescent technology must be used.

Traffic signals

THE PRODUCTS: State highway departments, counties and municipalities typically own traffic signals. The recommended standard covers new red and green traffic signal modules. Yellow traffic lights are not covered. Because the standard covers new signal sales or installations, it does not prevent replacement of conventional light bulbs in existing traffic signals.

THE STANDARD: The standard is based on LED – light emitting diode technology.

KEY FACTS: LED signals reduce energy use by about 90 percent and have additional maintenance and safety benefits. Unlike incandescent lamps, LED lights operate for many years. When LEDs age, they just get dimmer until replaced, thus preventing the safety problems that develop when a lamp in a traffic light burns out. On average, the LED technology pays for itself in lower energy bills in less than three years; traffic signals usually last about ten years. Currently, 10 traffic signal manufacturers offer product lines meeting the recommended standard. Approximately one-half of the red and of the green traffic lights in Washington have already been converted to LED lights.

Unit heaters

THE PRODUCT: Unit heaters are box-type heaters that usually hang from a ceiling and provide heating in open commercial and industrial spaces such as garage bays and warehouses. The recommended standard applies to natural gas and propane unit heaters only.

THE STANDARD: We recommend that states adopt a prescriptive standard that requires intermittent ignition devices (instead of a continuously burning pilot light) and requires power venting or an automatic flue damper. Power venting and automatic flue dampers are commonly available technologies that significantly reduce heat loss up the flue when the burner is idle. The 1992 federal standard for residential furnaces and the 2001 federal standard for conventional commercial furnaces effectively required these improvements, so the technology is the norm for other types of gas heating equipment.

KEY FACTS: Inefficient unit heaters typically have a seasonal efficiency of about 63 percent, whereas systems with seasonal efficiencies of 80 percent or more are common. The efficient heaters reduce annual energy use by about 20%. About 50% of the unit heaters sold today, including products available from all manufacturers, meet the recommended standard.

Electricity Resource Adequacy and Resource Planning Section 3

Integrated Resource Planning (IRP) or Least Cost Planning (LCP), out of favor for much of the nineties, is returning to favor in the 21st Century. Driven by concerns about resource adequacy—do we have enough power?—and who is responsible for providing it—utilities or the market—energy planners in the northwest and elsewhere have realized that resource planning at regional and utility levels can reduce some of the uncertainty, and hence, risk that buyers and sellers of electricity face. The state legislature considered IRP legislation in the 2004 session. The Utilities and Transportation Commission (UTC) has reinvigorated its IRP process and several of Washington's large utilities, both public and private are making significant investments in IRP.

This section examines how and why planning lost and regained favor and recommends some policies than can make resource planning effective going forward. We begin with an overview of Integrated Resource Planning (IRP) including a discussion of its value and limitations. This discuss is followed by a brief history of IRP in the Northwest – its early implementation, why it fell out of favor with the rise of deregulation and restructuring in the electricity industry and why it is now returning as a key planning tool. We next consider specific issues about IRP in Washington and the Pacific Northwest, especially the role of the Northwest Power and Conservation plan in setting the direction for the northwest electricity industry. The section then turns to more detail on the issues of electricity adequacy and reliability and their relation to IRP and how the changing role of BPA is forcing us to rethink who is responsible for a reliable and adequate electricity supply. We conclude the chapter with policy recommendations.

Integrated Resource Planning Essentials

IRP is a tool to help utilities and policy makers deal with uncertainty by enabling them to plan for how much electricity their customers are likely to need (future loads), anticipate changes in the kinds of loads they will need to serve, evaluate resources for serving loads, and assess the risks and costs associated with the various resources. In short, the "primary purpose of an IRP plan is to help utility executives decide which resources to acquire, what amounts to acquire, and when to acquire those resources." [1]

Integrated resource plans today generally consist of the following elements:

1. Forecast of load growth.
2. Inventory of current resources options available to meet anticipated loads
3. Analysis of when and how much additional resources will be needed
4. Analysis of the options for acquiring those resources: new generation, power purchases, energy efficiency, etc,
5. Analysis of the various risk factors (especially volatile fuel costs, long lead time for new generation and transmission, internalization of external factors such as carbon emissions limits or carbon taxes) involved in estimating load growth and acquiring resources.
6. Development of a least cost and least risk portfolio of resources for meeting load growth.

[1] Eric Hirst, Martin Schweitzer, Evelin Yourstone, Joseph Eto, *Assessing Integrated Resource Plans Prepared by Electric Utilities*, Oak Ridge National Laboratory, 1990 (ORNL/CON-298), p. 9.

Regulated utilities generally have to follow a prescribed format that is promulgated by their regulator. For example, the Washington UTC has adopted **WAC 480-100-238 Least Cost Planning**, which sets out what a utility's IRP should contain and the procedures it must use in bringing it to the Commission for approval.[2] (See Appendix A) Non-regulated utilities who do IRP, usually large consumer-owned utilities, adopt a format and process of their own choosing.

Value and Limitations of IRP

As noted, integrated resource planning is a systematic planning tool. As such it has both benefits and limitations. Benefits include:

1. Requires a careful economically based analysis of utility long term resource needs.

2. Increases the transparency of utility planning activities. For investor-owned utilities the UTC is required to review and approve the long term plan and a short term (two-year) implementation plan. Consumer-owned utility IRPs are typically subject to review and oversight by the utility's governing board.

   Transparency is further enhanced because, generally, the IRP process involves a moderate to high level of utility stakeholder and public input. For example, the Puget Sound Energy IRP process includes regular and detailed involvement of a technical, stakeholders group during the development of the plan.

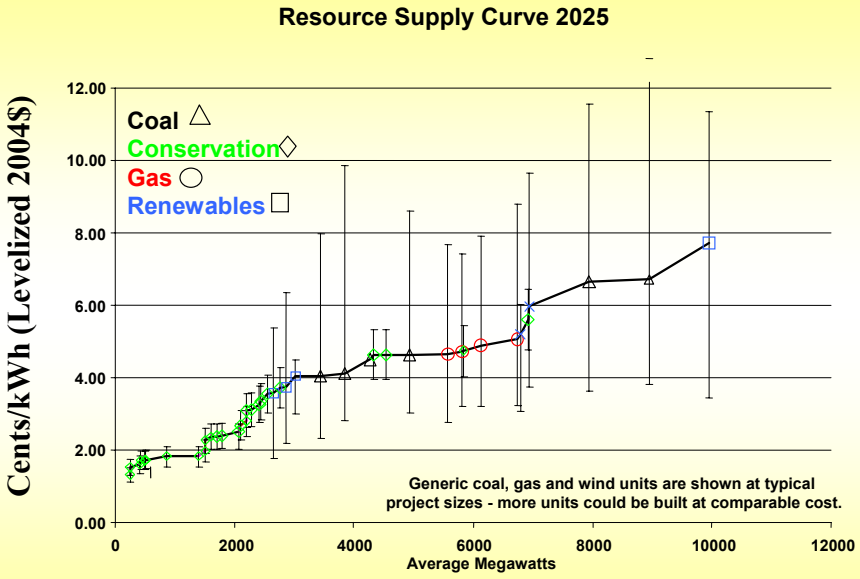
3. Because integrated resource plans are based on explicit cost-effectiveness criteria, the analytical outcomes very often yield significant amounts of energy efficiency investments as the preferred resource alternative. The Northwest Power and Conservation Council's 5th Power Plan concludes that nearly all of our electricity growth early into the next decade can be met by cost effective conservation. This is because its analysis reveals that there is a large amount of conservation and wind power that can be acquired cheaply and with little risk. (See Figure 1, Regional Electricity Supply Curve and Figure 2, Representative Development of Resource Plan).

4. Can provide a critical basis for comparisons of individual utility adequacy in an era of limited utility information. (See below the discussion of Adequacy, Reliability and IRP))

5. Can be complementary to any mandatory requirements such as an energy portfolio standard

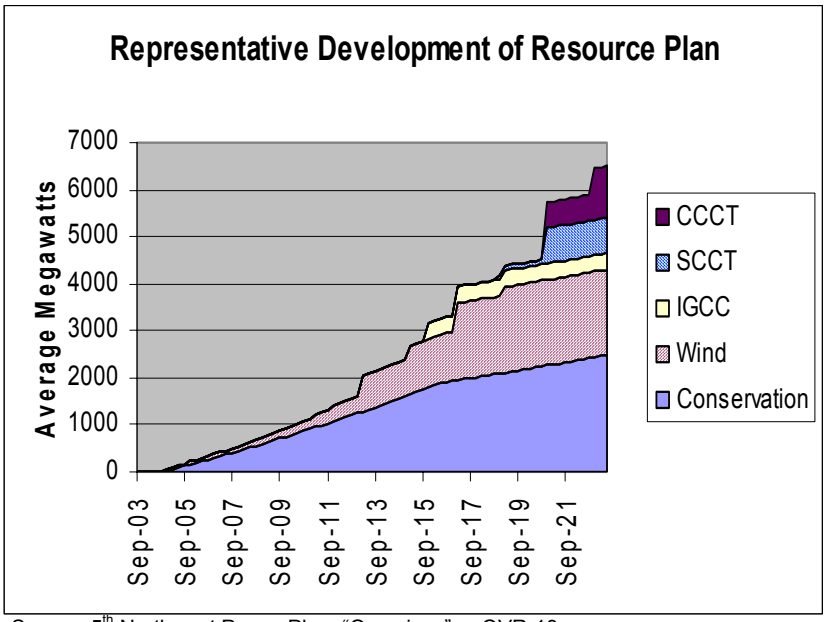
[2] The UTC is considering modifications to the current WAC under a rulemaking that is still open at the date of this writing. See WUTC Docket UE-030311 for electric utilities and Docket UG-030312 for natural gas companies.

Figure 1. Northwest Regional Electricity Supply Curve



Source: 5th Northwest Power Plan, "Overview," p. OVR-13

Figure 2



Source: 5th Northwest Power Plan, "Overview," p. OVR-13
Note: Legend: **CCCT**-Combined Cycle Combustion Turbine (natural gas); **SCCT** – Single Cycle Combustion Turbine (natural gas); **IGCC** – Integrated Gasification Combined Cycle (coal)

Integrated Resource Plans can also have significant limitations

1. As with most planning efforts, IRPs are only as good as the inputs. IRPs require significant amounts of input data on a wide range of factors. They also can require large amounts of computing resources and staff expertise, both of which are often expensive.
2. There are many uncertainties in any energy forecast/planning effort. We need look no further than the unanticipated 2000/2001 West Coast electricity crisis, or the rise and fall of world oil prices in 2004 to gain an appreciation of such uncertainty.
3. Even if plans predict the future perfectly there is no guarantee that they will be followed. Utilities routinely find reasons to acquire resources that are not within their plans and regulators and utility governing boards are generally willing to review decisions on a case by case basis rather than as part of a larger plan.[3]

IRP in Washington and the Western U.S.

In Washington, all of the IOUs submit IRPs to the UTC on a regular basis. Puget Sound Energy, Avista and PacifiCorp all completed IRPs in 2003 and are now in a new planning cycle leading to a new plan or revised plan in 2005. Among Washington's consumer owned utilities, Seattle City Light and Tacoma Power have recently completed new IRPs and Snohomish PUD's is in process.[4] It should also be noted that the Pacific Northwest has a unique entity, the Northwest Planning and Conservation Council, which is responsible for producing a least-cost plan for the Bonneville Power Administration and its customers (thus, the entire region) every five years.

Other states in the Western Interconnection require their Investor Owned Utilities to write and file Integrated Resource Plans and many of the larger publicly owned utilities such as the Los Angeles Water and Power District and Sacramento Municipal Utility District also write comprehensive IRPs. The current status and contents of many west-wide IRPs may be found at http://www.westgov.org/wieb/electric/adequacy/IRPtable7-04.pdf

The Rise, Fall, and Rise of IRP/LCP

Over more than two decades, utility integrated resource planning has waxed and waned as a tool. In the late 1970s and early 1980s, the economic consequences of the Washington Public Power Supply fiasco made the Northwest an early innovator in IRP. By the 1990s, IRP began to wane with the rise of the deregulated utility as the model of the future. Finally, another economically disastrous electricity event – the west coast electricity crisis of 2000/2001, revived the notion of analytically rigorous planning by the region and individual utilities. The details of this process are long and complex. Here we try to highlight some of the key historical elements that we believe are needed to inform current policy discussions on IRP.

We can identify three major reasons why long-term planning is coming back in favor in the Northwest. First is the collapse of the new competitive market model that underpinned the national movement toward electricity restructuring. Second—and

[3] For example, Avista is purchasing the other half of the Oregon-based Coyote Springs natural gas plant. That purchase is not included in their IRP. They don't appear to need significant energy resources until about 2013 and only start needing capacity resources in 2010.

[4] The IRPs for Puget Sound Energy, Avista and PacifiCorp may be found on their respective websites: http://www.pse.com/about/supply/resourceplanning.html, http://www.avistautilities.com/resources/plans/electric.asp, http://www.pacificpower.net/Navigation/Navigation36807.html.

related-is the discovery that resource adequacy can be problematical and that only a rigorous planning framework can ensure that adequate efficiency and demand-side and generation resources are acquired or built. Third, and specific to the Pacific Northwest, the movement toward removing the responsibility for the Bonneville Power Administration's (BPA) to acquiring resources for the region to the responsibility of its utility customers, means that planning responsibilities that once were located regionally will begin to be located locally.

Initial IRP/LCP development

Nationally, integrated resource planning (IRP) or least-cost planning (LCP) began in the 1980s when state utility regulators demanded that utilities demonstrate that they had considered all of the alternatives before being allowed to rate-base costly new power plants. [5] State commissions wanted to know whether less costly alternatives such as conservation and other demand side management programs could compete effectively with new power plant construction. The rise of independent power producers (IPPs) that were encouraged by the Public Utility Regulatory Policy Act (PURPA) (1978) and, later, the Energy Policy Act of 1992, made the purchase of power from non-utility suppliers an attractive option to utility owned generation. Finally, in the late 1990s, cost-effective wind power generation added one more power resource to the available mix. Thus, utilities needed to show to their regulators that they had considered and compared the costs and benefits of owning thermal generation (coal, gas or nuclear plants) with the costs and benefits of investing in conservation and renewable energy and with the costs and benefits of buying power from third parties. An integrated resource plan truly had to integrate all of the resources that were available to a utility into a plan that enabled that utility to serve its customers at the least cost while maintaining reliable service.

In the Pacific Northwest, the planning regime used by BPA and other utilities in the 1970s failed miserably by calling for the building of nuclear power and coal plants to meet what forecasters thought would be a steady and steep increase in demand for electricity. The Northwest Power Planning and Conservation Act of 1980 was passed precisely, among other things, to inaugurate a new era of power planning in which a comprehensive least cost plan for the region would be written by a new Northwest Power Planning and Conservation Council. The Council's power plans—the Council just completed its 5th Plan —have been pioneering works in resource planning. Each plan included the most advanced techniques in modeling and risk management available at the time. They have proven to remarkably accurate over the long run.

Utility Deregulation and the decline of IRP

However, just as the new IRP/LCP regulatory paradigm was taking hold, the movement toward restructuring the electricity industry began. The whole point of restructuring was to end the regulatory paradigm altogether by substituting competitive market discipline for governmental regulation. The assumption was that as integrated but regulated utilities lost ownership of their generation as well as their retail monopoly status there would be no need for new distribution-only utilities to make long range plans. Utilities would simply implement whatever purchases their retail customers made and add a distribution fee to whatever market price their retail customers paid for generation and transmission. As states began to authorize the restructuring of their electricity industries,

[5] For recent summaries of this dynamic, see Gary Vicinus, Mike Gettings, Art Holland, Tom La Berge, Ruben Moreno, "Resource Planning After the Crash," *Public Utilities Fortnightly,* September 15, 2003, pp. 42-47 and Michael T. Burr, "Back To Bidding," *Public Utilities Fortnightly,* June 1, 2003, pp. 20-21, 40.

state commissions abandoned IRP and LCP and instead focused on maintaining an orderly and transparent electricity market, a role which was secondary to the lead role played by the Federal Energy Regulatory Commission (FERC).

Even in states like Washington, where consumer-owned utilities predominate, a sort of de-facto restructuring began to emerge in the late 1990s. Many preference customers of BPA decided that they would be better off if they bought a significant share of their electric power on the spot market since market prices had fallen below those of BPA. In 1996, they renegotiated their 20 year contracts with BPA to allow them to reduce their BPA purchases so they could buy more on the market. At the time, it appeared that a robust electricity market would eliminate the need for resource planning since power supplies could simply be bought as needed.

IRP never fully disappeared in the Northwest

While IRP/LCP became irrelevant in restructured parts of the electricity system, it continued in non-restructured states like Washington. This insistence on regulation looked like rear-guard action since FERC seemed determined to impose restructuring on the entire country through its transmission orders, 888 and 889, and through its proposed Standard Market Design (SMD). However, the west-coast electricity crisis of 2000-2001, the collapse of Enron, and the revelations of market manipulation by energy traders enabled opponents of restructuring to regain the momentum and swing the pendulum back in favor of regulation. These events not only discredited restructuring as a public policy but they severely disrupted the emerging electricity markets as well. Independent power producers (IPP) found that they could not raise capital nor get loans because financial institutions did not trust short-term electricity markets and the short-term electricity markets withered as regulators became concerned over their volatility and demanded that utilities secure long-term supplies of power. Thus, the interests of utilities, IPPs and regulators converged toward a rediscovery of IRP/LCP: risk could be managed if utilities maintained a diversified portfolio of electricity resources; a diversified portfolio required planning for the long-term. The introduction of mathematical models used for financial planning into least-cost planning made it possible to increase the rigor of, and confidence, in the latest generation of IRPs and LCPs. The Northwest Power and Conservation Council's 5th Power Plan is an example of how the latest analytic techniques can be applied to regional electricity planning.

Just prior to the run-up in electricity prices along the west coast in 2000, the Northwest Power Planning Council (now the Northwest Power and Conservation Council) published Northwest Power Supply: Adequacy/Reliability Study Phase I Report, (March 2000) This report was one of the first to explain that the Northwest's dependence on imports of electricity from outside of the region at critical times of the year meant that resource adequacy in the Northwest depended on a surplus of generation in California. The fact that nearly all utilities are now, either directly or indirectly, dependent on purchases of electricity in addition to the electricity they generate themselves means that the question "Do we have enough generation?" can only be answered through an assessment of the entire western inter-connection. Load serving entities need to know if the resources they will need are available somewhere in the west and if there is transmission available to get the power to them. Thus, over the last three years, the major west-wide intergovernmental and reliability organizations—Western Interstate Energy Board (WIEB), Committee on Regional Electric Power Cooperation (CREPC) and the Western Electricity Coordinating Council (WECC)—have embarked upon resource adequacy studies to determine, first, how to measure resource adequacy, and second, to actually do the measuring. These efforts are expected to ultimately yield an adequacy metric or

metrics for states, regulators and reliability organizations to adopt as voluntary targets or enforceable standards. In all of these efforts, planners have identified IRPs as a key building block in constructing a picture of regional and sub-regional adequacy.[6]

The development of a new model for the role of BPA in resource acquisition is the third reason why discussions about IRP/LCP have become more frequent in the northwest. Under the Northwest Power Planning and Conservation Act of 1980, BPA is responsible for meeting all loads that publicly owned utilities place upon it. The Act also requires BPA to supply power to investor owned utilities that request BPA to supply them, although not at the lowest preference rates that public utilities receive. Over the last ten years most of the northwest utilities have become uncomfortable with BPA's role as the aggregator of demand and have sought to reduce BPA's role in power markets. The electricity crisis of 2000-2001 increased their discomfort. BPA made decisions about whom to supply (the utilities often disagreed with BPA's decisions) and then spent large amounts of money to buy out the power contracts rather than purchase very expensive power in order to fulfill them. The subsequent large increases in BPA rates led many utilities to conclude they would be better off if they met their own load growth and made power acquisition decisions on their own. By 2004 a regional consensus seems to have been reached that BPA would only supply as much power as the Federal System (federally owned Columbia River System dams and the Columbia Generating Station nuclear power plant) produced to its preference customers while they would be responsible for meeting any power requirements in excess of that. [7]

This change would place more responsibilities on utilities to develop generation, increase energy efficiency investments, or purchase electricity in order to meet their needs beyond what BPA can supply. These utilities will need to do some kind of long-range planning in order to minimize the risk of exposure to short-term electricity markets. IRP/LCP is the obvious tool for them to use.

Specific Northwest and Washington Issues

There are four issues that are specific to the Pacific Northwest that have led to a renewal of interest in IRP. The first is the just adopted 5th Northwest Power Plan while the second is the impending change in the role of BPA in the acquisition of new resources for its customer utilities which will change the implementation of the Regional Power Plan. The third is the treatment of hydropower in resource adequacy analysis. Finally, Washington has a new set of Electricity Strategy Principles which firmly locate responsibility for electricity adequacy in the hands of the state's load-serving utilities. Each of these factors lend support to better integrated resource planning at all levels: regional, state and utility.

5th Power Plan

There is a dramatic change in tone and content between the Northwest Power and Conservation Council's 4th and 5th Power plans. The 4th, which was adopted as a draft in 1996 and revised in 1998, proclaimed:

[6] See pp. 8-10 of chapter 8 "Resource Adequacy," 5th Power Plan for a summary of west-wide adequacy planning.
[7] See BPA's "Regional Dialogue" papers, http://www.bpa.gov/power/pl/regionaldialogue/index.shtml, the Northwest Power and Conservation Council Recommendation on Future of BPA, now Chapter XI of 5th Power Plan, http://www.nwppc.org/energy/powerplan/draftplan/(11)%20Future%20Role%20of%20BPA%20(PP).pdf
and the GAO Report, *Bonneville Power Administration: Better Management of BPA's Obligation to Provide Power Is Needed to Control Future Costs,* GAO-04-694, August, 2004 at http://www.gao.gov/new.items/d04694.pdf

> The electricity industry in the Northwest is evolving rapidly in the direction of increased competition. This trend is the product of the interaction of a number of developments. Prices for natural gas have fallen dramatically. And the technology of gas-fired electricity generation has been advanced to the degree that new combined-cycle gas power plants are relatively low-cost, flexible resources. These changes have broken down the financial barriers that once blocked entry into the electricity generation business.
>
> These forces have been amplified by important policy changes at federal and state levels. Federal policies encouraging competition in generation began with the Public Utilities Regulatory Policy Act of 1978 (PURPA) and have been advanced by the National Energy Policy Act of 1992. The Federal Energy Regulatory Commission is in the process of adopting new rules to ensure competitive wholesale power markets. Progress toward competition at the retail level has been left to the states to determine and shape. In many states, the prospect of lower-cost power is driving consumers of large amounts of electricity to seek access to the competitive market or at least to market prices.
>
> While rates in the Northwest are generally lower than elsewhere in the country, the pressure for retail competition is evident here as well. The Bonneville Power Administration, which markets electricity from the federal power system, is a power wholesaler and, as such, is already fully exposed to competition. Bonneville's size and importance in the regional power system mean that wholesale competition will have dramatic effects in the Pacific Northwest regardless of actions at the retail level. This plan reviews the evolution toward increased competition and the forces driving it in Chapter 2. [8]

The Council itself said that the plan is "long on analysis and short on conclusions," because as the region moves into unknown territory, previous prescriptions will not necessarily apply. [9]

Six years later, prices for both natural gas and electricity have risen dramatically, the competition wave has crested, and the 5th Power Plan is as long on conclusions as it is on analysis. In lieu of warnings about how the market needs to be constructed and regulated correctly, there is a detailed action plan that prescribes what has to be done by whom in order to realize the benefits of the least-cost/least-risk plan that the Council recommends to the region.[10]

While the 5th Power Plan is much more prescriptive than the 4th, the ability to implement the plan is as difficult as ever. This is because the fragmentation of the Northwest electricity industry that began in the 1990s has continued even as restructuring as a market economy has slowed down. Remember that the Northwest Power Planning Act of 1980 envisioned the Power Plan as a binding framework for the Bonneville Power Administration to use when it acquired power for its customers. Since BPA was expected to be the acquirer of new resources for all utilities in the region, the Power Plan was envisioned as a LCP/IRP for the region as a whole. However, because of surpluses in the region followed by above market BPA prices followed in turn by more surpluses, BPA has never really had to acquire power pursuant to the Power Plan, except to meet

[8] Northwest Power Planning Council, *Draft 4th Power Plan,* page 1-3, online: http://www.nwcouncil.org/library/1998/98-22/chapter1.htm
[9] Ibid, p. 1-10.
[10] "Making it Happen-The Action Plan," Northwest Power and Conservation Council, 5th Draft Power Plan, 2004, http://www.nwppc.org/energy/powerplan/draftplan/(0)%20Action%20Plan%20Final%20(PP).pdf

the conservation targets set by the Plan. In fact, the Federal System actually produces less electricity now than it did when the Act was passed because the hydroelectric system operates under more constraints for salmon recovery. Since 1980, all of the IOUs and many of the consumer owned utilities have acquired generation resources of their own. In addition some 17% of the region's generation is now owned by IPPs. As a result, BPA's share of the region's generation resources has declined and will decline further since it is now expected that BPA will not acquire any more resources (except conservation) to meet the load-growth of its customers. Without any regional coordination, the burden of implementing the resource mix of the Plan would, therefore, falls to the region's utilities acting independently. The Action Plan notes this fragmentation. It calls for the Council to act as convener of all stakeholders to coordinate their roles in implementing the Plan's conservation targets and to harmonize their power acquisition strategies.

Many of the region's utility executives have already noted that the Council Plan treats the region as if it were (still) served by one large utility. They have pointed out that the 5th plan is already in conflict with the IRPs of the utilities that have completed or are working on them. Much of the conflict is a matter of perspective: what is analytically superior for the region as a whole cannot necessarily be implemented by individual utilities. For example, the cost of buying power from a merchant-owned power plant (IPPs) in the region may be less than the cost to a utility of building one of its own, but if Wall Street credit rating firms lower the bond rating of utilities that purchase power rather than possess hard assets, the real-world cost to a utility may be higher. Nevertheless, these dueling IRPs provide important analytic checks and balances: the utilities are challenged to first, re-assess their own assumptions about cost and risk and, second, find ways to acquire lower cost resources than Wall Street prefers; the Council is similarly challenged to both re-appraise its own assumptions and to find ways to make its least-cost/least-risk plan a reality.

Adequacy, Reliability and IRP

Ultimately, the whole point of writing an IRP is to assure the customers of utilities that electricity will be reliably available and at the lowest cost. Reliability has two components. One is the expectation that there will be no interruptions in services due to outages caused by mechanical or system failures. This is reliability in the engineering sense: the equipment and people can be counted on to operate as per their specifications. The other part of reliability is the assurance of enough electricity supply to meet demand at a reasonable price. This aspect of reliability is usually referred to adequacy: enough supply to meet demand at a relatively stable price. IRPs are designed to help utilities maintain adequacy of supply and generally have little to say about reliability in the engineering sense.

One aspect of resource adequacy that an individual utility IRP cannot fully address is the availability of resources that are expected to be bought on the market, especially short term purchases. Because of seasonal variations in load, utilities in the Northwest and their counterparts in the southwest have long sold surplus power to each other, the Northwest to California in the summer and California to the Northwest in the winter

In the past, reservoirs were operated in the fall and early winter under the assumption that the region would realize better than critical water conditions. Should a dry year ensue, the region could import surplus energy from the southwest. There was also the contractual ability to interrupt a portion of the Direct Service Industry load when out-of-region surplus energy was not available. These contractual agreements with the DSIs no

longer exist. But, the Northwest is still connected to the southwest. Both regions should be able to benefit from the diversity in peak demand seasons. Consequently, determination of adequacy should reflect the ability to import power from outside the region. However, the implication of this is that any Northwest adequacy standard and determination must be closely coordinated with other entities in the Western Interconnection.[11]

Since it is cheaper for both the southwest and northwest to rely on each other's seasonal surpluses than to build more generation on their own, each needs to know what adequacy standard the other is using and what resources each utility is relying upon. When BPA bought and sold most of the surplus power on behalf of the northwest and California had a traditional regulated integrated monopoly system, it was relatively easy for each region to understand what was happening in the other. Now, with an ever-changing regulatory framework in California and a reduced role for BPA in the Northwest, the need for integrated planning is greater but the ability to do it is less. The gradual growth of energy markets and moves toward restructuring have increased the amount of power that utilities in the northwest buy from independent power producers under contracts of varying length. As discussed earlier, we know that the Northwest as a region has adequate supplies of energy, but since much of the surplus is not owned by, or committed to, regional utilities, the only way to know if individual utilities have adequate supplies is to read their IRPs or survey them about their resource portfolios. And if they are counting on California to supply their seasonal peaking needs, we need to know if California has adequate generation. Similarly California is counting on the availability of surplus northwest power to meet its seasonal peaking needs, so California utilities and planners need to understand what is available in the northwest.

It is because of the need for utilities and regions to rely upon each other's seasonal surpluses to achieve resource adequacy at the lowest cost, that western electricity planning and reliability agencies are looking at the possibility of establishing adequacy standards for all utilities in the west. CREPC, an association of energy offices and utility regulators from the western states, has established a Western Regional Assessment Team (WRAT) of analysts to examine alternative methodologies and data requirements for establishing adequacy standards and has asked the Western Electricity Coordinating Council (WECC), the western regional reliability organization, to make relevant data available and to discuss adequacy standards with its members.

In the meantime, the National Electric Reliability Council (NERC) has published a discussion paper on Transmission and Resource Adequacy that is designed to guide regional reliability councils (such as WECC) in their work on adequacy.[12] The national energy bill currently stalled in Congress contains a reliability chapter, almost universally supported, that calls for mandatory reliability standards. If the bill is ever passed (and there is some thinking that is might pass in the Congress that convenes in January, 2005), the work being done by WECC and WRAT will become even more important.

California has chosen not to wait for national or regional reliability organizations to act. The California Public Utility Commission has developed an adequacy standard that it will require California's Investor Owned Utilities to meet by 2006. They will need to own or have long-terms contracts to supply 15% to 17% more electricity than their most recent

[11] 5th Power Plan, Chapter 8: Resource Adequacy, p. 8-3.
12 ftp://www.nerc.com/pub/sys/all_updl/pc/rtatf/RTATF_ReportBOTapprvd_061504.pdf NERC is also continuing to revise its overall reliability standards. See http://www.nerc.com/~filez/standards/Version-0.html

demand peak.[13] While this may make California's electricity supply more reliable, it will require other states and regions in the west to figure out how to harmonize their own adequacy standards with California's. California is still wrestling with whether and how to require adequacy standards for its consumer owned utilities which supply about 25% of the electricity to California consumers.

Changes in the Role of BPA

The "one utility model" for the region will undergo further change when and if BPA adopts the new consensus model for its activities. As briefly discussed above, a regional consensus has emerged that BPA should simply allocate the existing federal electricity system in the northwest among its preference customers, who would then be responsible for meeting their own load growth. While there is still much uncertainty about when and how the transition to this new system will take place, BPA has accepted this new role in principle and has begun to plan for it. [14] While BPA will still retain responsibility for implementing the fish recovery mandates of the Power Act, it is clear that the Act's guidance for the building of new resources will be challenged. Since BPA will not be directly acquiring resources for the region it is not clear that anyone will be bound to follow the Act's mandate that conservation and renewable energy resources be acquired before looking to others.

As noted earlier, in the Northwest, the Power and Conservation Council has been doing resource assessments since 2000. The 5th Power Plan calls for a regional effort to develop a common resource adequacy metric so that all load serving entities can measure their resource adequacy the same way. The Plan also calls for movement towards a voluntary resource adequacy standard. In it comments on the draft Plan, BPA has asked the Council to shepherd the region to a resource adequacy standard. "BPA has stated on a number of occasions that a resource adequacy standard is critically important to ensuring the region a reliable, economic, and adequate power system now that BPA is proposing to limit its power supply role. Such a standard will provide clarity to all of the load serving entities in the Northwest regarding their load serving obligations."[15]

Despite the growing movement toward adequacy standards there are a number of obstacles to overcome. First, there is no consensus on how adequacy should be measured nor, even if a metric is agreed upon, what level should be used. California's standard may suit a system that is principally based on thermal resources (nuclear, coal and natural gas) purchased under long term contracts, but it won't necessarily suit the hydro-based system of the northwest. For California, the number and capacity of power plants that can be called upon to produce electricity is key metric. In the northwest, it is the amount of energy that can be produced by the hydro system at various times of the day and year that is the key metric. The northwest has traditionally relied upon "critical water" planning to assess whether resources are adequate, but this standard has become more difficult to use as river operations have become constrained by fish recovery rules and more thermal resources have been added to the system. Thus, the Power Council has developed the Loss of Load Probability metric to measure the risk the northwest faces in losing resource adequacy. However, while this metric is useful for the region as a whole, not all utilities have similar resource mixes, making a common standard difficult to apply.

[13] See the CPUC's most recent action, "Interim Opinion on Resource Adequacy," October 28, 2004: http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/41416.htm
[14] See the references in fn 7, above.
[15] BPA comments on the 5th Power Plan on the Power Council Website: http://www.nwcouncil.org/energy/powerplan/draftplan/comments/bpa.pdf. See especially, pp. 1-2.

Second, unless there is a federal mandate (and there will be difficulties in enforcement, even then), there are, as of now, no regional bodies or mechanisms to enforce a regional resource adequacy standard.[16] It is possible to envision some possible solutions. For example, all of the utility regulating commissions in the northwest states could agree among themselves and with BPA, on a common metric and standard which the commissions would enforce on the IOUs they regulate and which BPA would require via its power sales contracts with its customers. Alternatively, utilities in the region could develop an acceptable standard among themselves and agree to be bound to it. These or any other solutions will require more technical analysis and much stakeholder negotiation so the plea by BPA to begin immediately is well taken.

Next Steps

Which brings us back to IRP. In any move towards adequacy standards—or even understanding the adequacy situation—it is necessary to have a detailed understanding of the load and resources of each utility and their own plans for meeting their loads. The Guiding Principles of the Washington State Energy Strategy update of 2003 firmly placed load serving entities, i.e., utilities in most cases, as the central player in ensuring reliable and adequate electric service. The Strategy Update also listed a number of possible policies and strategies that would support the ability of utilities to do their job. Among these was the suggestion that a requirement for Integrated Resource Planning by all load serving entities would increase confidence in the ability of utilities to manage effectively in a changing policy environment.[17] As BPA's role in acquiring resources to meet load growth diminishes and many new generating resources are being built by Independent Power Producers and utility consortiums, IRPs become useful tools for utilities to demonstrate to themselves, their customers and stakeholders, to each other and to the wider public and regional reliability agencies that they are in control of their resource portfolios.

1. The CTED Energy Policy Division recommends that the legislature renew work on a bill that would require all load serving entities in Washington, other than full requirements customers of the Bonneville Power Administration, to adopt and periodically update Integrated Resource Plans. Such a requirement was included in SHB2333, which was considered during the 2004 legislative session. For the reasons discussed in this report, it has become even more important to ensure that load serving entities have adequate resources to serve their loads. IRPs are an important first step toward that goal.

2. The State of Washington (through CTED, the UTC, and the Power Council) should continue to support the work of the Western Interstate Energy Board (WIEB) and the Western Electricity Coordination Council (WECC) in the development of west wide resource adequacy assessment and standards. The State should actively participate in the Regional Adequacy Forum that will be convened by the Power Council pursuant to the 5th Power Plan.

3. CTED and the Power Council should provide support, and where possible, resources to help Washington's consumer owned utilities develop or enhance their IRP capabilities. In particular, this should include improving the ability of utilities to perform more extensive risk analysis and mitigation.

[16] The western U.S. states have been uniform in their support for mandatory reliability standards
[17] All State Energy Strategy documents may be found at http://www.cted.wa.gov

4. The State of Washington, primarily through the Energy Facility Site and Evaluation Council (EFSEC), and in conjunction with the Northwest Power and Conservation Council, should implement the recommendation in the 5th Power Plan Action Plan that "permitting agencies and project developers should prepare and maintain an inventory of ready-to-develop projects for possible future needs." Also known as "site banking," this action would both reduce the cost and time needed to develop generation facilities.

Appendix – Least Cost Planning

WAC 480-100-238 Least cost planning. (1) Purpose and process. Each electric utility regulated by the commission has the responsibility to meet its load with a least cost mix of generating resources and improvements in the efficient use of electricity. Therefore, a "least cost plan" must be developed by each electric utility in consultation with commission staff. Provision for involvement in the preparation of the plan by the public will be required. Each planning cycle must begin with a letter to the utility from the commission secretary. The content and timing of and reporting for the least cost plan and the public involvement strategy must be outlined in a work plan developed by the utility after consulting with commission staff.

(2) Definitions. "Least cost plan" or "plan" means a plan describing the mix of generating resources and improvements in the efficient use of electricity that will meet current and future needs at the lowest cost to the utility and its ratepayers.

(3) Each electric utility must submit to the commission on a biennial basis a least cost plan that must include:

(a) A range of forecasts of future demand using methods that examine the impact of economic forces on the consumption of electricity and that address changes in the number, type, and efficiency of electrical end-uses.

(b) An assessment of technically feasible improvements in the efficient use of electricity, including load management, as well as currently employed and new policies and programs needed to obtain the efficiency improvements.

(c) An assessment of technically feasible generating technologies including renewable resources, cogeneration, power purchases from other utilities, and thermal resources (including the use of combustion turbines to utilize better the existing hydro system).

(d) A comparative evaluation of generating resources and improvements in the efficient use of electricity based on a consistent method, developed in consultation with commission staff, for calculating cost-effectiveness.

(e) The integration of the demand forecasts and resource evaluations into a long-range (e.g., twenty-year) least cost plan describing the mix of resources that will meet current and future needs at the lowest cost to the utility and its ratepayers.

(f) A short-term (e.g., two-year) plan outlining the specific actions to be taken by the utility in implementing the long-range least cost plan.

(4) All plans subsequent to the initial least cost plan must include a progress report that relates the new plan to the previously filed plan.

(5) The least cost plan, considered with other available information, will be used to evaluate the performance of the utility in rate proceedings, including the review of avoided cost determinations, before the commission.

[Statutory Authority: RCW 80.01.040 and 80.04.160. 01-11-004 (Docket No. UE-990473, General Order No. R-482), § 480-100-238, filed 5/3/01, effective 6/3/01.]

An Examination of Current High-Energy Prices — Section 4

Energy prices, after being relegated to the back pages of the business section for more than a decade, have over the last two years moved to the front pages of the nation's newspapers. Energy policy, especially after the 9/11 terror attacks and the war in Iraq, has also moved to center stage in our policy debates. This section briefly examines recent trends in energy prices, the causes of price increases, and presents an estimate of the economic impact of higher energy prices for Washington State. The focus is on the three primary energy sources for businesses and consumers in Washington: petroleum products, natural gas, and electricity.

Petroleum product consumption and price trends

Petroleum, also referred to as crude oil, is the most common fossil fuel in the U.S., supplying 38 percent of the nation's energy. It is used primarily to produce transportation fuels, but also to fire industrial boilers and for synthetic chemical manufacture. Consumption of refined petroleum products from 1960 to 2003 for Washington State is shown in Figure 1 below[1]. During this period consumption has increased at an average rate of 2 percent per year. From the late 1970's to the mid 1980's consumption was relatively flat due to a series of recessions, high prices and efficiency efforts. Since 1985 consumption has increased steadily, though it declined some during 2001-2003 due to another recession and reduced air travel following the 9/11 terrorist attacks.

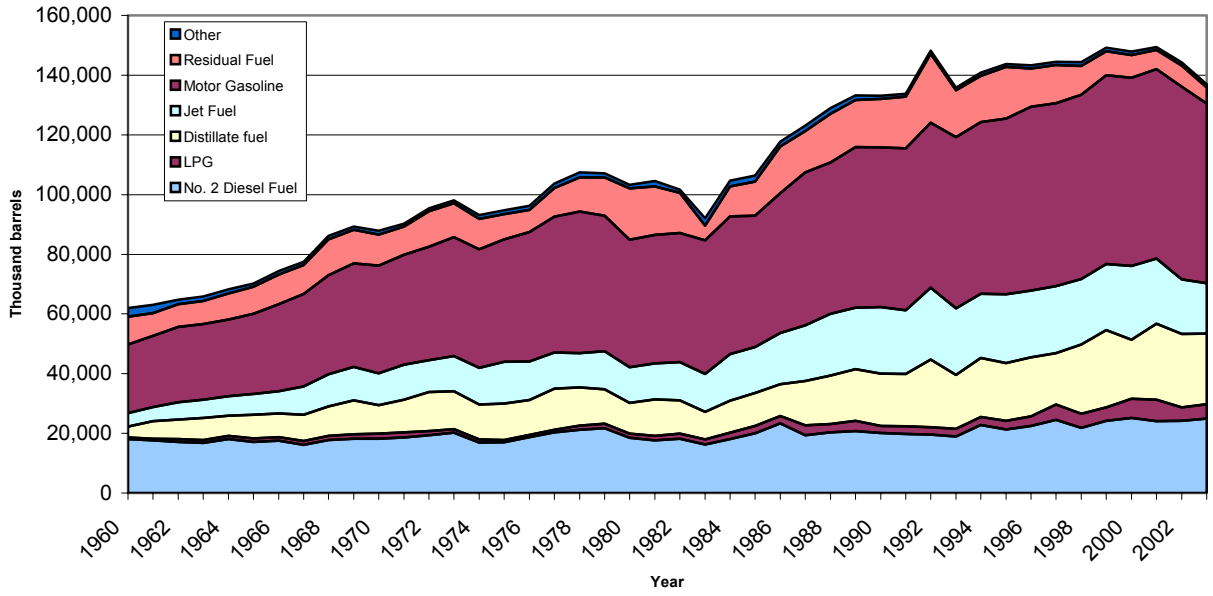


Figure 1: Consumption of refined petroleum products in Washington: 1960-2003
Source EIA: see http://www.eia.doe.gov/emeu/states/sep_use/total/use_tot_wa.html for data and definitions.

[1] The United Sates Energy Information Administration (EIA) tracks consumption of the refined petroleum products. Year 2002 and 2003 are estimates and may be revised.

Crude oil reached a record high price level in nominal dollars[2] of just over $55 per barrel during October of 2004. These elevated crude oil prices have contributed to record high prices (in nominal dollars), for many refined products derived from crude oil such as gasoline and diesel fuel. Figure 2 below illustrates the price per barrel in nominal and constant dollars for crude oil from 1970 to 2004 using a worldwide mix of different varieties of crude oil[3].

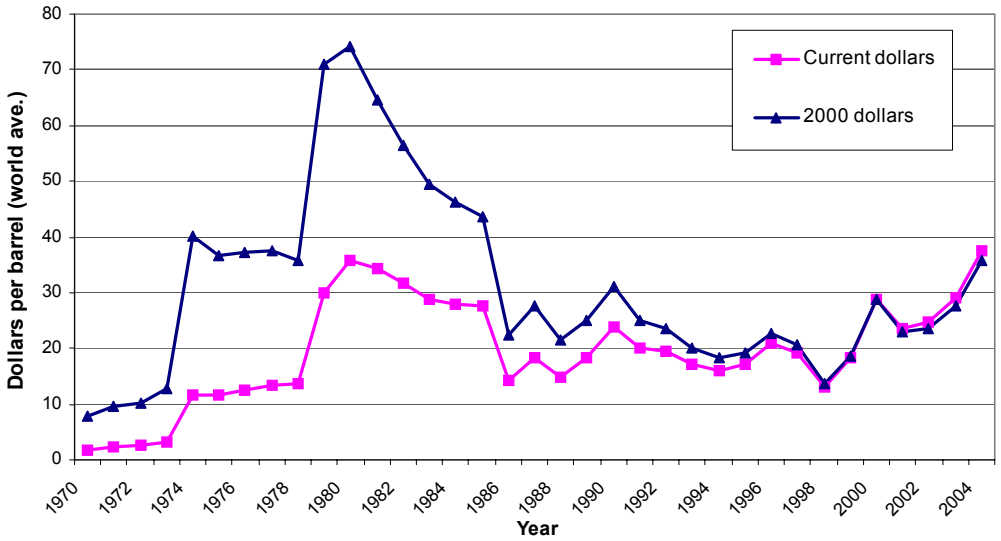


Figure 2: Global annual <u>average</u> crude oil prices for 1970-2004 in nominal and constant 2000 dollars. Source: EIA

Figure 2 reveals that when crude oil prices are expressed in constant 2000 dollars, they were actually much higher during the early 1980's when they reached a price of $74 per barrel during 1981. However, current prices are much higher than we have experienced over the last 15 years.

The cost of crude oil comprises just over 50 percent of the cost of a gallon of gasoline or diesel fuel. The rest of the fuel cost is made up of refiner costs and profits, transportation and retail costs, and state and federal taxes. Figure 3 below illustrates the retail cost of gasoline and diesel fuels for the U.S. and the West coast.

[2] Nominal dollars are also referred to as current dollars. For more accurate comparisons prices are expressed in "real" or constant dollars of a certain year. Frequently year 2000 dollars are used for price comparisons.
[3] The most commonly reported crude oil price is for West Texas Intermediate (WTI), which is a high quality crude with low viscosity, acidity and sulfur content. Most of the crude oil sold by other nations is inferior in quality to WTI, which sells for a premium of $5 to $8 dollars per barrel.

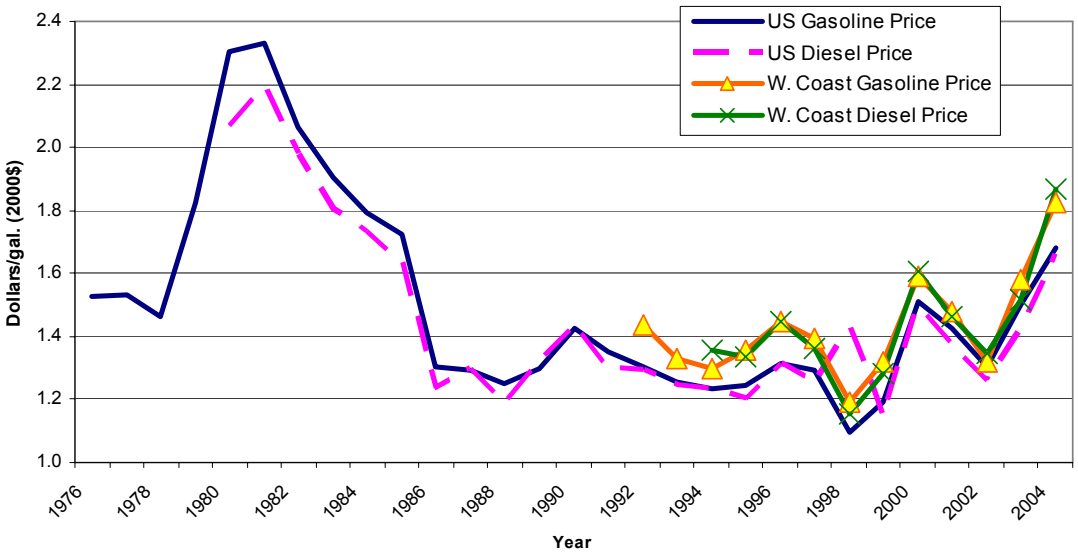


Figure 3: Price of Gasoline and Diesel for the US and West coast in constant 2000 dollars.
Source: EIA

These are several interesting points illustrated in Figure 3. First, when expressed as constant 2000 dollars the retail prices for gasoline and diesel were significantly higher around 1980. Fuel prices were quite low during the 1990's; shot up briefly during 2000, retreated during the recession of 2001-02, and then began to increase again during 2003 and 2004. Note that the price of gasoline and diesel are about 10 cents per gallon higher on the West coast. This price differential is a result of the isolation of the West coast market and the limitations on regional refining capacity. At the far right of Figure 3 a more recent phenomenon can be observed, which is that diesel fuel, historically slightly cheaper than gasoline, has in the last year or two become more expensive compared to gasoline. Several factors are thought to have contributed to the greater price increase for diesel including the rapid economic expansion in Asia, skyrocketing demand for heavy trucks used to haul freight, and the policy choice by European Union nations to switch more of their light duty vehicle fleet towards diesel fuel.

Prices for other refined petroleum products such as jet fuel and residual and fuel oil have also risen dramatically in the last two years as shown by Figure 4.

The price increase for jet fuel from 1998 to 2004 is particularly pronounced. Note the sizable decline in jet fuel price after the 9/11 terrorist attacks.

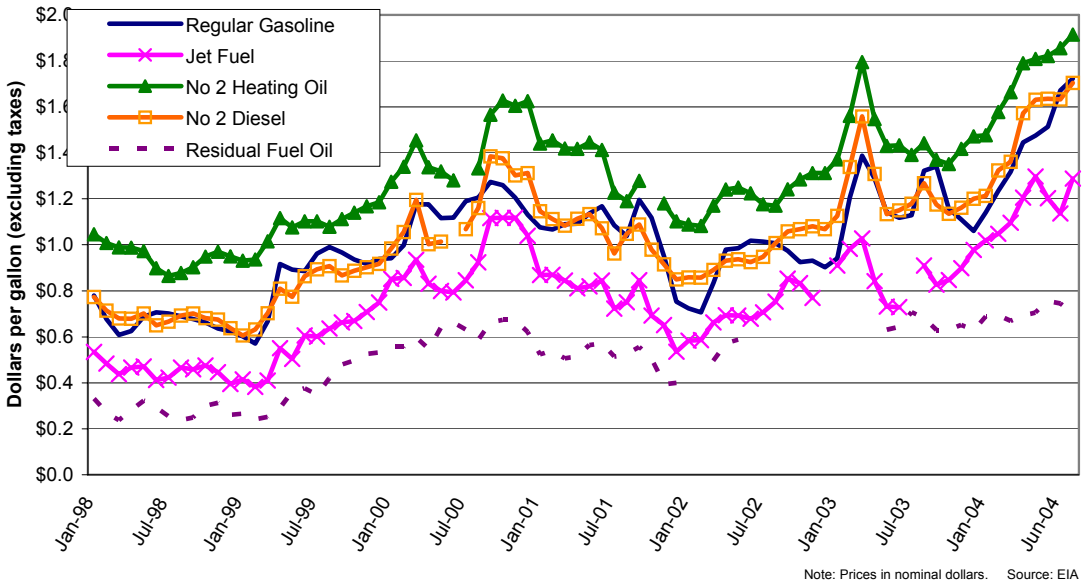


Figure 4: Prices, excluding taxes, for refined petroleum products in Washington State 1998-2004 in nominal dollars.

Several factors are recognized as contributing to the recent price increases for petroleum products. These factors can be grouped into supply, demand and industry or market structure groupings. The primary factors are:

Supply factors

1. Minimal remaining global spare production capacity (1-2 percent) caused in part by a shortage of new production capacity being brought on line. A lack of investment over the last five years in exploration and new production by energy companies following the crude oil price collapse of 1998-99.
2. Continued U.S production decline: U.S. crude oil production peaked in 1970 and has since declined by 50 percent. Regionally Alaska crude oil production peaked in 1987 and has declined about 50 percent[4].
3. Loss of 1-2 percent of global production capacity due to the war in Iraq, severe hurricanes in the Caribbean, and political turmoil in Venezuela and Nigeria.

Demand factors

1. A rapid increase in demand for petroleum products in developing countries, particularly India and China.
2. Continued strong growth in demand for transportation fuels in the U.S., driven in part by the increasing consumer choice of less fuel efficient SUVs and pickup trucks[5]. This is more of a problem in the Western U.S. where commuting distances are greater and public transport is a less viable option for commuters.
3. Lack of effort by the federal government to increase the light duty vehicle fuel economy standards over the last twenty years.

[4] Washington state refineries receive about 75 percent of their crude oil input from Alaska.
[5] Pickup trucks, vans and SUVs have a lower federal Corporate Average Fuel Economy (CAFE) standard than cars: current standards are 27.5 miles per gallon (mpg) for cars and 20.7 mpg for the light truck category.

Market structure factors

1. Reestablishment of market power by OPEC nations. Over the past 15 years or so OPEC has slowly increased its market share to nearly 40 percent and is once again able to exert some control over world oil prices.
2. Consolidation of the global and national energy business and the possibility of market power being exerted by these new larger consolidated businesses. This may be especially true with regards to developing surplus refining capacity in the U.S.
3. Isolation of the West coast petroleum products markets from the rest of the U.S. petroleum market.
4. Threat of terrorism and political instability in certain petroleum exporting countries is adding a price premium: estimated by energy analysts to be about $5 per barrel.
5. Decline of the U.S. dollar, the currency in which oil is sold, has given OPEC and other exporting nation's justification to set higher market prices.

Natural gas consumption and price trends

After petroleum, natural gas is the second most commonly used fuel in the U.S. supplying about 24 percent of the nation's energy needs. Natural gas is used for space heating, firing of industrial boilers, as a chemical feedstock, and increasingly to generate electricity. To some degree natural gas and petroleum are substitutes for each other in the industrial sector, but unlike petroleum, natural gas is not as easy to transport and is therefore primarily produced domestically or imported from Canada (approximately 83 percent domestic and 16 percent from Canada in 2003). The natural gas industry was highly regulated until the late 1970's when price controls and consequent supply shortages led to a decade long deregulation process. Deregulation occurred in stages and was complete by around 1990.

Natural gas consumption in Washington State can be characterized by a period of growth through the early 1970's, a period of decline through the early 1980's, and renewed growth through most of the 1980's and 1990's: see Figure 5. These trends reflect the supply and price situation during these periods. Total consumption in 1999 was about a third more than the previous consumption peak in 1973.

Residential and commercial consumption was relatively stable through much of this period, showing modest declines in the late 1970's, stability during the 1980's, and then moderate growth during the 1990's. Together, the residential and commercial sector accounted for a little less than 50 percent of natural gas consumption in Washington in 1999.

Industrial natural gas consumption tends to be more volatile and price sensitive than the residential and commercial sectors. During the 1980's industrial natural gas consumption was less than half the amount in 1973 and did not return to the 1973 peak until 1998. When natural gas supplies were unreliable and prices high from the mid 1970's to the early 1980's, industries used other fuels for process heat, increased their energy efficiency, or cut back production. During this period there was growth in the

consumption of biofuels[6], but overall energy use in the industrial sector dropped 10 to 15 percent.

During the 1970's natural gas use for electricity generation was relatively rare in Washington State, but over the last decade its use has increased rapidly. Figure 5 is somewhat misleading because prior to 1997 some natural gas fired electricity generation was included in the industrial sector. A change in EIA's accounting methodology has moved gas consumption by non-utility power generation and some co-generation facilities from the industrial to the electricity generation sector[7]. Notice the spike in natural gas consumption during the 2000-01 west coast energy crisis.

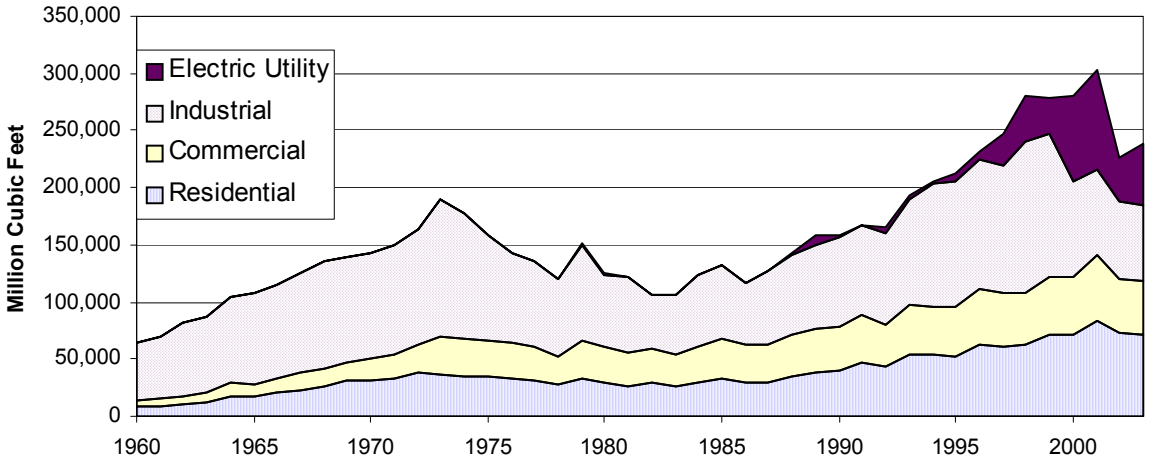


Figure 5: Historical natural gas consumption in Washington State 1960-2003.
Source: EIA

Natural gas prices have fluctuated widely for residential, commercial and industrial customers over the past several decades. Figure 6 illustrates the price trends for residential, commercial and industrial natural gas prices from 1970 to 2004 expressed in constant 2000 dollars.

As with petroleum, natural gas prices when expressed in constant dollars were highest during the early 1980's. From the late 1980's up to 2000 natural gas prices were low and relatively stable. However, during the last four years natural gas prices have been volatile and have risen to nearly the same elevated levels seen over twenty years ago.

[6] Primarily wood waste products from the forestry industry.
[7] We estimate that during the 1990's about 25,000 million cubic feet of industrial natural gas consumption was used to generate electricity.

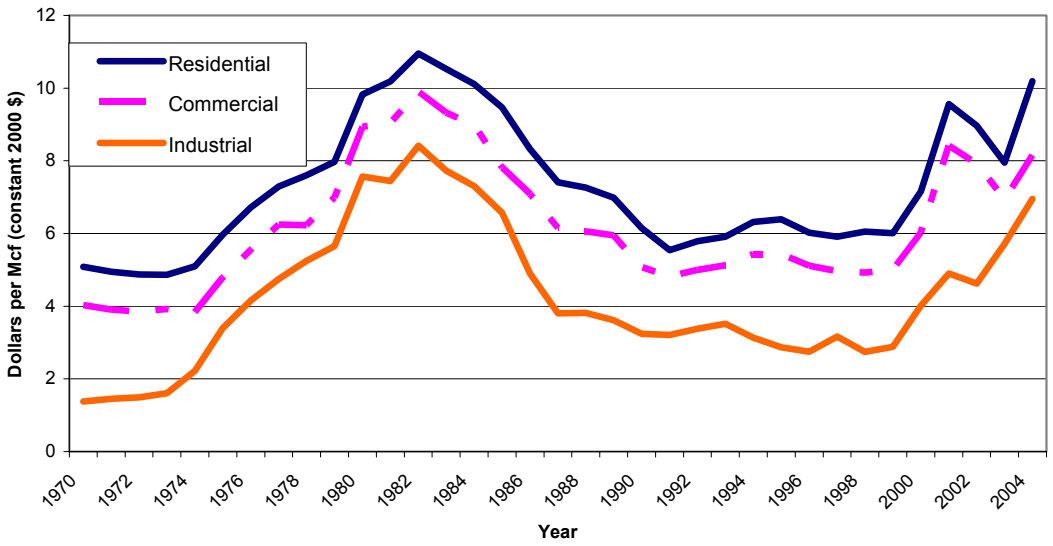


Figure 6: Natural gas prices for the residential, commercial and industrial sectors in Washington State in constant 2000 dollars per thousand cubic feet (Mcf). Source: EIA

Several factors are recognized as contributing to the recent price increases for natural gas. These factors can be grouped into supply, demand and industry structure groupings. The primary factors are:

Supply

1. Domestic natural gas supply has not been able to keep up with demand growth as forecast by the Department of Energy and others.
2. Imports of natural gas from Canada after growing during the 1990's and covering the U.S. supply gap, peaked in 2001 and have declined slightly since.
3. Imports from other nations with abundant natural gas supplies are currently limited by available U.S. Liquefied Natural Gas (LNG) terminal capacity. LNG is a more expensive supply option that requires costly and long-term infrastructure investments.

Demand

1. Demand for natural gas grew steadily during the 1990's both nationally and in Washington state: see Figure 5. This growth was in part caused by low prices, population growth and the relative environmental advantages of burning natural gas relative to other fossil fuels.
2. Demand growth has been and is likely to remain strong in the electric power generation sector. Increased consumption by the power sector has put upward pressure on gas prices, which has lead to closures in energy intensive industries.

Market structure factors

1. Growth of the North American natural gas pipeline network over the last 25 years has created a continental gas market. Previously exports of some Canadian natural gas were limited to West coast markets, which kept regional prices low. As the

continental gas market developed the Northwest has had to compete with other regions for natural gas from Western Canada and the Rocky Mountain regions.
2. Consolidation of the global and national energy business and the possibility of market power being exerted by these new larger consolidated businesses.

Recent price trends in electricity prices

The West Coast electricity/energy crisis that began late in 2000 and ran through most of 2001 caught government, utilities, businesses, and consumers by surprise. Many factors contributed to this crisis including electricity market restructuring in California, market manipulation by some suppliers, the drought in the Northwest, and failure by utilities to add enough new generation capacity. These factors combined to limit available electricity supplies and dramatically increased the wholesale price of electricity on the west coast.

Many regional utilities had turned to the wholesale markets for a portion of their electricity supply and suddenly found themselves paying prices per unit of electricity[8] that were a factor of ten higher than historical norms. Several utilities used up their cash reserves and had to borrow in order to purchase on the wholesale market, a process that eventually reduced their credit status. During 2001, in order to secure electricity supplies, many utilities and the Bonneville Power Administration (BPA) entered into long-term power purchase agreements at rates that were much higher than historical norms. As a consequence utilities and BPA had to raise the rates they charged their customers.

Average retail residential and commercial electricity rates increased approximately 30 percent since 1999, the last year before the west coast energy crisis. Industrial prices increased about 50 percent. Figure 7 illustrates the nominal electricity prices by sector for the period 1970-2002. The primary factors contributing to higher electricity prices are:

1. Higher prices for natural gas, which powers much of the new electric generation on the West coast.
2. Poor market design and failed deregulation in California's electricity market, which resulted in higher priced long-term electricity contracts.
3. Confusion about the future of market deregulation.
4. Failure to invest in new generation and transmission capacity during the 1990's.

Some retail electricity prices have begun to stabilize. Some high priced contracts have expired, BPA has been able to slightly decrease its wholesale rates, and utilities have focused on rating operating expenses. However, some high priced contracts remain in force and wholesale natural gas costs continue to put price pressure on utilities with gas-fired generators or contracts.

[8] Prior to the crisis electricity sold for $20-40 per Megawatt-hour depending on the season. During the crisis period wholesale prices frequently exceeded $200 per Megawatt-hour

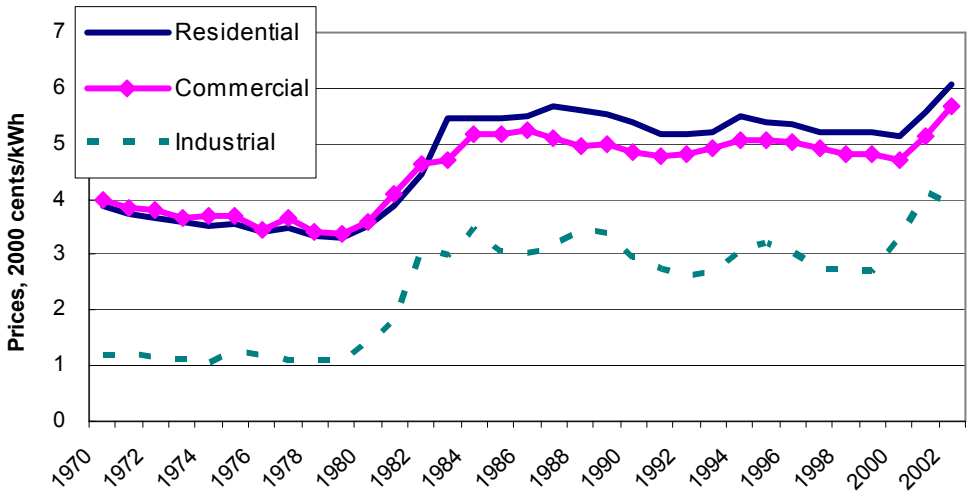


Figure 7: Retail electricity prices by sector in Washington State, 1970-2002.
Source EIA and Bureau of Economic Analysis (BEA).

How do energy prices in Washington compare to other states?

Washington's relative advantage as a low cost electricity state has been declining. In 1999 Washington had the lowest state average electricity prices for residential and industrial consumers and the next to lowest commercial prices. By 2003, a significant number of states had lower commercial and industrial electricity prices while our residential price ranking remained about the same. Since 1999 Washington's relative ranking for natural gas prices has improved slightly for the commercial and residential sectors. However, Washington's industrial natural gas prices were among the lowest in 1999, but by 2003 had slipped closer to the U.S. average.

Table 1: Washington State Ranking for Electricity and Natural Gas Prices

Electricity Prices

Sector	1999	2001	2003
Residential	*50*	*49*	*49*
Commercial	*49*	*47*	*38*
Industrial	*50*	*34*	*32*

Natural Gas Prices

Sector	1999	2001	2003
Residential	*34*	*33*	*38*
Commercial	*32*	*22*	*36*
Industrial	*44*	*42*	*33*

Rank scale: 50 = lowest, 1 = highest, Source: EIA.

Washington ranks much higher than average for gasoline and diesel fuel prices. According to the weekly AAA survey of service station prices in early December of 2004, Washington State ranked eighth in gasoline price and seventh in diesel prices. Our higher gasoline and diesel prices are primarily the result of the isolation of the west coast petroleum fuels market, limited surplus refinery capacity in the west for peak demand season, and slightly higher fuel taxes. However, relative to other states in the western United States our fuel prices are middle of the pack as shown below in Table 2.

Table 2: Gasoline and diesel fuel prices for the Western U.S. for early Dec. 2004.

State	Regular gasoline	Diesel
UT	$1.95	$2.23
AZ	$1.97	$2.20
OR	$1.98	$2.24
WA	**$1.99**	**$2.25**
ID	$2.01	$2.27
NV	$2.09	$2.22
CA	$2.21	$2.30

Source: Automobile Association of America

How do retail electricity, natural gas and gasoline price increases affect Washington's "average" household and commercial business?

Estimated average monthly electricity bills have increased about 30 percent for residential and commercial consumers from 1999 to 2001. Estimated natural gas bills increased by nearly 60 percent for residential consumers and nearly 70 percent for commercial consumers from 1999 to 2002. Estimated monthly residential gasoline and diesel bills have increased by over 30 percent from 1999 to 2003. Table 3 illustrates the economic impact of recent high energy prices on residential and commercial consumers[9].

Table 3: Impact of electricity, natural gas, and gasoline price increases on households and commercial businesses.

Electricity Expenditures	1999	2002 Estimated	Difference
Annual expenditures per **residential** customer	**$** 700.06	$ 889.08	$ 189.02
Monthly expenditures per **residential** customer	$ 58.34	$ 74.09	$ 15.75
Annual expenditures per **commercial** customer	$ 4,593.69	$ 6,063.67	$ 1,469.98
Monthly expenditures per **commercial** customer	$ 382.81	$ 505.31	$ 122.50

Natural Gas Expenditures	1999	2002 Estimated	Difference
Annual expenditures per **residential** customer	$ 541.13	$ 860.40	$ 319.27
Monthly expenditures per **residential** customer	$ 45.09	$ 71.70	$ 26.61
Annual expenditures per **commercial** customer	$ 3,063.15	$ 5,176.73	$ 2113.57
Monthly expenditures per **commercial** customer	$ 255.26	$ 431.39	$ 176.13

Gasoline expenditures	1999 expend	2003 estimated	Difference
Annual expenditures per **household**	$1357.61	$1760.71	$403.10
Monthly expenditures per **household**	$113.13	$146.73	$33.59

[9] Note that these are statewide averages. Electricity prices can vary significantly by utility depending on the utility's mix of resources.

The average residential household saw their monthly electricity bill increase about $16/month from 1999 to 2002 and their monthly natural gas bill increase about $27/month from 1999 to 2001. The average commercial business saw their monthly electricity bill increase a little more than $122/month and their natural gas bill increased a little more than $176/month. The average residential household saw their monthly gasoline bill increase about $34/month from 1999 to 2003[10]. Commercial gasoline expenditures cannot be easily estimated and are not included in Table 3.

What do high-energy prices mean for Washington State?

During the 20th century energy expenditures measured as a percentage of the United States Gross Domestic Product (GDP) have steadily declined, primarily due to improvements in energy resource extraction technology, energy efficiency, and a shift towards less energy intensive businesses. The oil price shocks during the period of 1973 to 1981 temporarily reversed this trend and drove up US energy expenditures sharply. The high-energy prices of this period induced numerous efficiency efforts, and served to promote many new petroleum and natural gas supply side projects. By the mid 1980's energy prices and expenditures were declining and continued to decline through the 1990's. Energy expenditures in Washington State followed a pattern similar to the larger U.S. economy. Energy expenditures as a percent of Gross State Product (GSP) are a bit lower in Washington, particularly expenditures for natural gas and electricity. This is primarily a result of our access to inexpensive hydropower, which results in a direct reduction in expenditures for electricity and also diminishes the incentive for directly using natural gas for space and water heating. Figure 8 illustrates energy expenditures in the US and Washington State as a percentage of GDP and GSP respectively[11].

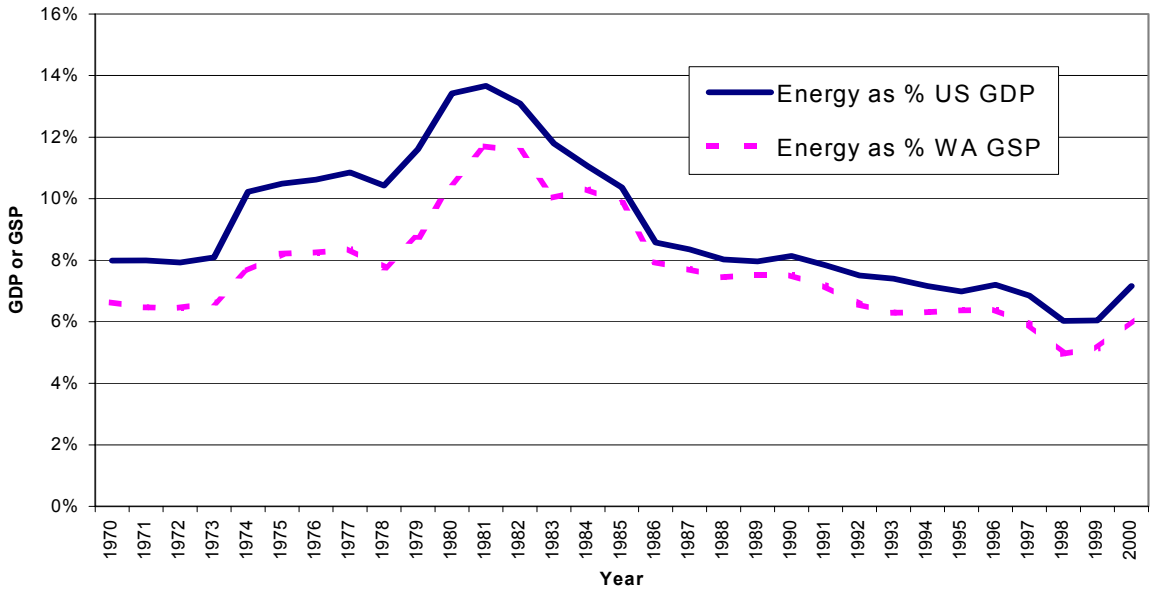


Figure 8: Annual Energy expenditures as percent of US GDP and Washington GSP.
Source EIA and BEA

[9] The increase in household expenditures for gasoline is even larger if the comparison is between 1999 and 2004.
[11] State GSP values for 1970-76 are imputed from national data.

Estimating price and expenditure increases from 1999 to 2003-04

Over the last five years and particularly during the past two years, there have been sizable increases in the prices for energy resources in the U.S and Washington State. How severe are these price increases and what are the potential economic impacts on the Washington State economy? The United States Energy Information Administration (EIA), a part of the Department of Energy, tracks energy prices and expenditures by fuel and sector for the U.S. and individual states. The most recent complete year of data that the EIA has compiled is for the year 2001. However, the EIA has unit prices (dollars per gallon, cents per Kilowatt-hour, etc) for energy sources such as petroleum[12], natural gas and electricity through June of 2004. As an approximation we have used current and historical reported unit energy prices and the historical EIA consumption and expenditure data, to estimate recent energy expenditures at the national and state level. Table 4 presents estimated energy prices for 2003 and 2004 year to date (YTD) relative to 1999: prices expressed in nominal dollars and percent increase relative to 1999.

Table 4: Primary Energy Prices in Washington for 1999, 2003 and 2004 YTD.

Fuel/Energy Source	1999	2003 *	2004 Y.T.D. *	Price unit
Gasoline	1.29	1.68 (30)	1.95 (52)	$/gallon
Diesel	1.25	1.61 (28)	1.98 (58)	$/gallon
Jet fuel	0.59	0.87 (49)	1.23 (111)	$/gallon
LPG (propane)	0.91	1.20 (34)	1.30 (43)	$/gallon
Residual oil	0.38	0.66 (72)	0.74 (94)	$/gallon
Natural Gas	3.83	6.90 (80)	7.71 (101)	$/Mcf
Electricity	4.1	5.7 (39)	5.4 (32)	Cents/KWh

* 1999 to 2003 and 1999 to 2004, Percent increases are shown in parentheses.

Gross State Product values for 2003 and 2004 were estimated by assuming a 2 percent annual growth rate for each year[13]. Table 5 presents the historical 1999 energy expenditures and GSP as well as the estimated energy expenditures and GSP values for 2003 and 2004 YTD. The estimated increase in expenditures and fraction of state GSP devoted to energy expenditures is also shown.

Table 5: Historical and Estimated State Energy Expenditures

Time period considered	Annual energy expenditures (Billions of dollars)	Increase in expenditures (Billions of dollars)	State GSP (Billions of dollars/year)	Energy expenditures as % GSP	Change in energy expenditures as % GSP
1999 (nominal $)	10.7	----	208	5.1	----
1999 (2003 $)	11.6	----	226	5.1	----
2003 (2003 $)	14.8	3.2	239	6.2	1.1
2004 YTD (2003 $)	16.0	5.4	244	6.6	1.4

[12] The petroleum category encompasses a wide variety of refined products such as motor gasoline, diesel, jet fuel, residual fuel, etc…

[13] This is a typical GSP growth rate minus any projected growth from population increases, which has recently been about 1 to 1.2 percent per year for Washington State.

Estimated increase in energy expenditures

As shown in Table 5, the estimated increase in energy expenditures for Washington State, when comparing 1999 to 2003 and 2004, is in the range of 30 to 40 percent. This estimate is based on the assumption of constant energy consumption levels, in other words residential commercial and industrial consumers make no short-term response to higher prices. This assumption most likely results in an overestimate of energy expenditures for 2003 and 2004, but avoids the difficult economic issue of dealing with reductions in consumer and business satisfaction, or reductions in industrial sales and production due to higher energy prices. The higher prices, if maintained through the rest of 2004, could shift an estimated 5.4 billion dollars (1.4 percent) of state GSP from non-energy to energy purchases: an amount equivalent to about 900 dollars per resident of Washington State.

From the state's perspective the impact of increased expenditures on energy is dependent on the location of the business that actually receives payments for selling the energy resource. Since petroleum and natural gas are produced and delivered from out of state, frequently by multinational corporations, an argument can be made that relative to the 1999 several billion dollars have left the state. Because most of our electricity is generated within the state the increased expenditures for electricity may not represent as significant of a diversion of resources towards out of state entities. However, a counter argument can be made that much of the additional revenue does leave the state, since most of our recent higher electricity rates can be attributed to long term contracts signed with energy-marketing companies during and after the 2000-01 west coast energy crisis.

The overall economic impact of increased energy expenditures is also dependent on action taken by energy consumers. In the short run consumers in Washington State will not be able to significantly negate the impact of higher energy prices through changes in purchases or behavior[14]. As a consequence, recent energy price increases will have a small but noticeable negative impact on the State's economy. Over the long-run consumers and businesses may be able to avoid a larger fraction of the increase in energy prices through improved energy efficiency or behavioral changes. Note that higher electricity prices were one of the primary reasons for the shutdown of the aluminum industry in 2001.

Several well known economists have made statements about the negative impact of higher energy prices on the U.S. economy. Alan Greenspan, chairman of the Federal Reserve Bank, indicated that high-energy prices, while not likely to throw the U.S. or world economy into recession, have acted like a tax, equivalent to about 0.75 percent of GDP[15]. Stephen Brown, an economist at the Houston Federal Reserve, stated that based on research with earlier petroleum price shocks, the current 50 to 100 percent increase in natural gas prices could result in a 0.3 to 1 percent reduction in U.S. GDP[16].

[14] A common rule of thumb, based on economic research, is that a short-term consumer response to a hypothetical 10 percent increase in energy costs results in a 2 percent reduction in energy consumption.
[15] This information is from a Federal Reserve Bank speech given by Alan Greenspan on Oct. 15, 2004
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http://www.ucei.berkeley.edu/

Washington's Greenhouse Gas Emissions: Sources and Trends Section 5

After remaining relatively stable from the mid 1970's through the mid 1980's, greenhouse gas emissions have increased steadily over the last fifteen years. Much of the increase has been in the transportation and the electric power generation sectors. The principal greenhouse gases emitted from activities in Washington State include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and perfluorocarbons (PFCs). Greenhouse gases differ in their impact on global warming[1]. For example, one pound of nitrous oxide is 296 times more potent than a pound of carbon dioxide in affecting global warming. Figure 1 shows the contributions by sector and gas for the years 1990, 1995 and 2000.

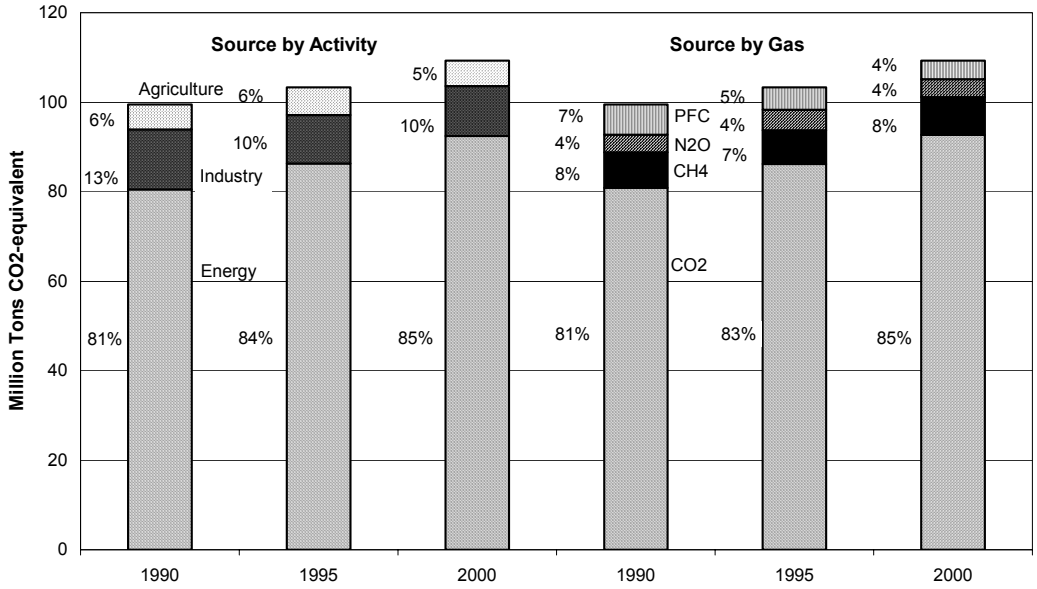

Figure 1. Washington State Greenhouse Emissions by Sector and Gas Type

Total greenhouse gas emissions increased from 99.5 million tons[2] in 1990 to 109.3 million tons in 2000: an increase of about 1 percent per year. Energy related emissions are the dominant source of greenhouse gas emissions and have increased from 80.5 million tons CO_2-equivalent in 1990 to 92.5 in 2000, an increase from 80 percent of total emissions to 85 percent over the past decade. Carbon dioxide is the dominant greenhouse gas followed by methane, nitrous oxide, and perfluorocarbons.

Greenhouse gas emission data for 2001 and 2002 are available from the Energy Information Administration (EIA) but are preliminary and subject to revision, and therefore were not included in Table 1. Because of the shutdown of much of the aluminum industry in Washington during 2000-01, it is expected that total emissions for 2004 will show little or no increase relative to year 2000 emissions[3].

Carbon dioxide emissions within the energy related category were 86.5 million tons in

[1] Potency factors global warming potential relative to CO_2: CH_4 =23:1, N_2O = 296:1, PFCs = 7,235:1 .
[2] By using the above global warming potency factors total emissions can be expressed as CO_2 equivalent (CO_2-e) emissions. CO_2 equivalent emissions are reported in metric tons: 1000 kilograms or 2205 pounds.
[3] The aluminum industry was responsible for most of the PFC emissions in Table 1 and some direct CO_2 emissions as well. The industry probably is responsible for emissions of 4-5 million tons CO_2 –e.

2000, and are the dominant source of greenhouse gas in Washington - 79 percent of total greenhouse gas emissions. Non-energy industrial sector greenhouse gas emissions have declined primarily due to reduced emissions from aluminum production. Non-energy agricultural sector greenhouse emissions have remained relatively constant but their percentage contribution has declined as total emissions have increased.

Energy –Related CO_2 Emissions

The rest of this discussion focuses on energy related CO_2 emissions, which is the state's largest category of greenhouse gas emissions. Figure 2 shows the *direct* CO_2 emissions from the combustion of fossil fuels in the buildings, industrial, transportation, and electric power sectors from 1960 to 2002. The buildings sector includes both the residential and commercial sectors. Emissions linked to the use of electricity by the building, industrial, and transportation sectors (*indirect* emissions) are not included in this discussion on direct emissions. Emissions for 2001 and 2002 are preliminary values and should be viewed as such.

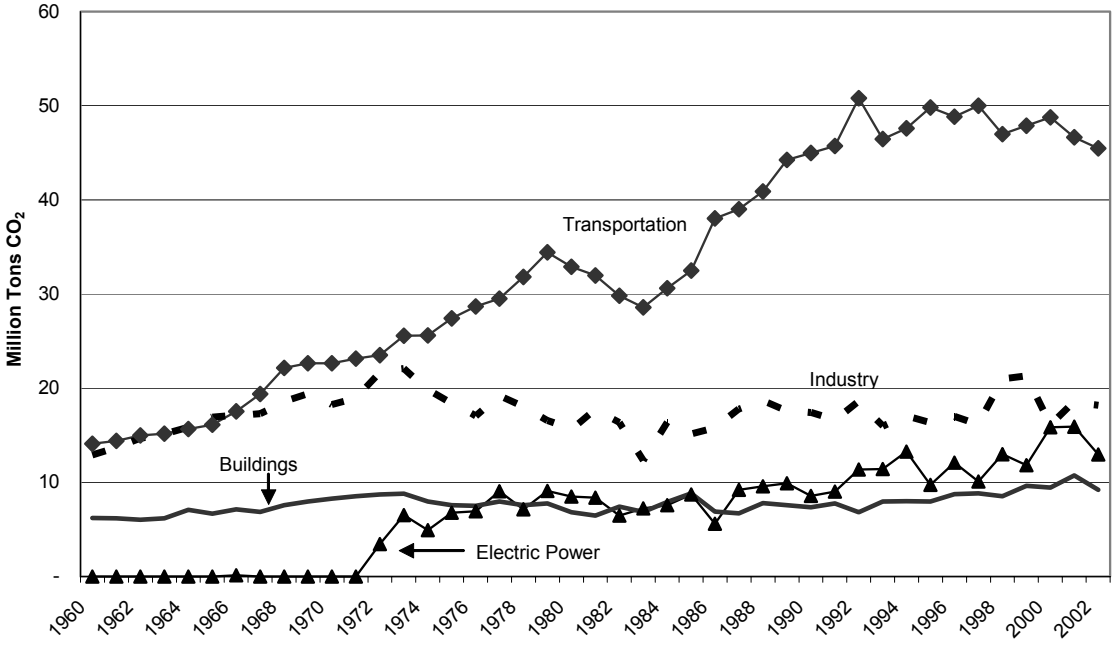

Figure 2. Washington State Historical Trends of Carbon Dioxide Direct Use Emissions by Sector * Note the buildings sector includes both commercial and residential sectors.

Buildings and Industrial Sector

Emissions from the direct use of fossil fuels in the building and industrial sectors have been relatively constant over the past 40 years, even though the use of energy in these sectors has increased. Two factors have allowed the phenomena of increased energy usage and constant greenhouse gas emissions. First, there has been fuel switching from coal and petroleum fuels to natural gas, which produces fewer pounds of carbon dioxide per million BTU than coal or petroleum fuels. Second is the increasing efficiency with which energy is used in the industrial and building sectors.

Transportation sector

The other obvious characteristic of Washington's energy related carbon dioxide emissions is the dominant role played by the transportation sector, which includes emissions from

highway and non-highway vehicles, trains, planes and ships. In 1960, transportation accounted for 42 percent of energy related carbon dioxide emissions. The percentage increased to 52 percent by 1980, and has remained relatively constant since[4].

Motor gasoline (51%), diesel (16%) and jet fuel (22%) use dominate CO_2 emissions within the transportation sector, accounting for 90 percent of this sector's emission in 2000. While absolute CO_2 emission have increased for the transportation sector, the share of CO_2 emissions within this sector corresponding to motor gasoline use actually declined from 65 percent in 1972 to about 45 percent in the early 1990s. The principle cause of this decline was the increase in federal vehicle fuel efficiency standards for cars and trucks during the 1970s through late 1980s. The decline in percent of emissions associated with motor gas usage occurred despite significant increases in the number of vehicles and total vehicle miles traveled. However, since the early 1990s the percent of emissions associated with motor gas usage has steadily increased, as federal fuel economy standards have not changed for nearly fifteen years, and consumers have increasingly switched to less fuel-efficient trucks and sports utility vehicles.

Electric power sector

Carbon dioxide emissions from electric power generation are quite different from the other sectors. Up until 1972, there were essentially no carbon dioxide emissions, as electric power was generated almost entirely by hydropower. When the coal fired Centralia power plant came on line there was an obvious and dramatic increase in emissions. Emissions stayed relatively constant until the late 1980's when natural gas began to be used for electrical generation and emissions increased. Over the last five years even more natural gas generating capacity has been added in the Pacific Northwest. Figure 3 shows CO_2 emissions by fuel type since 1990 for the generation of electricity.

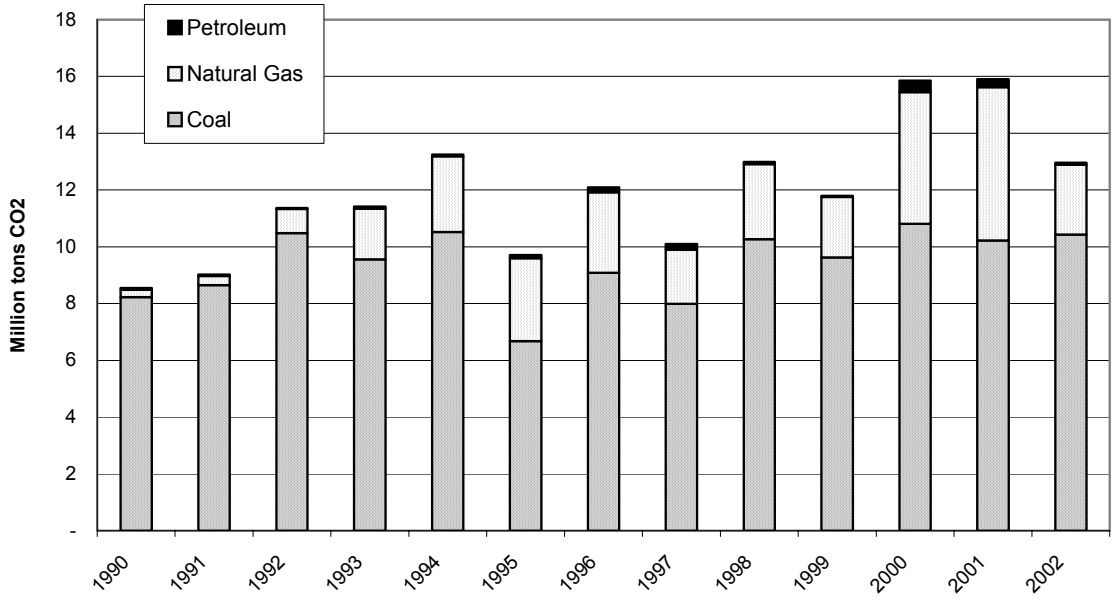

Figure 3. Washington State Carbon Dioxide Emissions from Electric Power Generation by Fuel Type

2. The transportation sector includes residual bunker fuel used by large ships. This category varies significantly on a year-to-year basis: reported CO_2 emissions in 1984 associated with residual transportation fuel combustion were 0.9 million tons, while in 1992 reported emissions were 12 million tons. This large variance is primarily an accounting phenomenon and means trend analysis in the transportation sector must be undertaken with care.

Notice the jump in emissions associated with natural gas fired generation during the West Coast electricity market crisis during the years 2000 and 2001. In 2002 gas fired generation declined due to a rebound in hydropower resources and decreases in electricity demand due to a recession and higher electricity prices.

Perspectives

Over the last 40 years there are several trends worth noting as they provide some perspective in determining strategies to mitigate our greenhouse gas emissions. Figure 4 shows the trends for total CO_2 emissions, the per capita emissions and emissions per dollar of gross state product ($GSP) from 1977 to 2001, with GSP expressed in constant 2003 dollars. The numbers are indexed so that the value in 1977 is equal to 100 (1977 is the first year that GSP data became available). Over this period, total emissions have increased about 40 percent, the emissions per capita have stayed relatively constant, and the emissions per $ GSP have decreased by 45 percent.

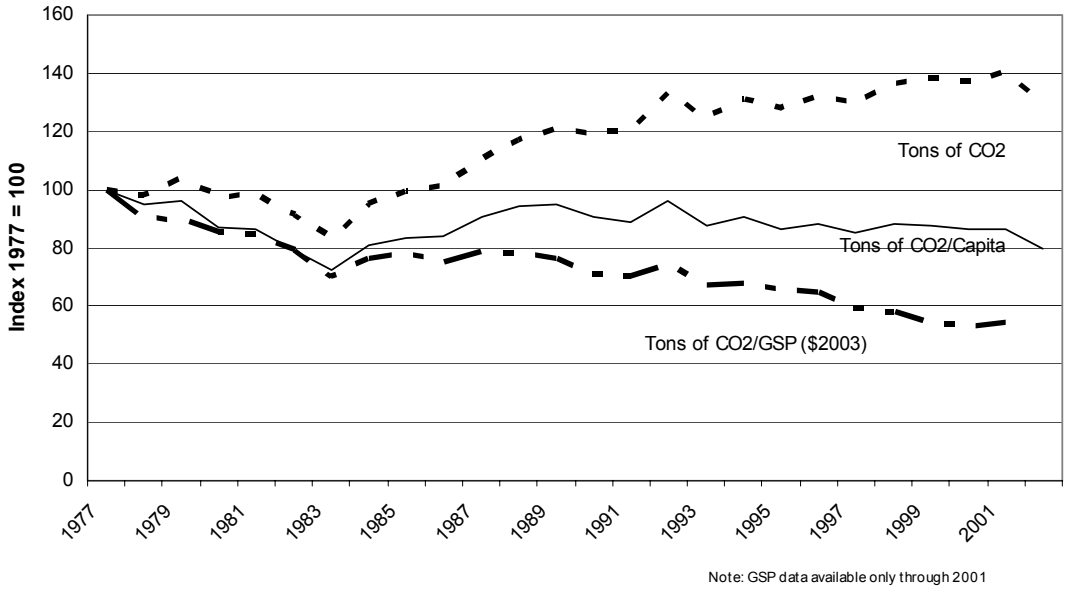

Figure 4. Washington State Trends in Energy CO_2 Emissions: Total, Per Capita and Per $GSP.

A number of factors contributed to the trends shown in Figure 4. First, total CO_2 emissions after declining in the face of high energy prices and a series of recessions during from the mid 1970's to the early 1980's, have increased slowly at about 2 percent per year. This is roughly equivalent to the state's population growth rate[5]. Second, per capita CO_2 emissions remained roughly constant over the past 20 years, despite increasing per capita consumption (house size, vehicle size and miles traveled, etc.). This is possible because of efficiency improvements in direct fuel use and electricity consumption, as well as fuel switching to less carbon intensive fuels. Finally, CO_2 emissions per $GSP has declined markedly over the past 25 years. The reasons for this decline include the efficiency improvements and fuel switching factors mentioned above, plus continuing productivity growth and the transformation of our society from a manufacturing based economy to a more services and information-based economy.

[5] The relationship between the growth in population and increased CO_2 emissions over the last 40 years is almost linear and has a correlation coefficient of 90 percent indicating a strong relationship. During this period there have been many changes in energy use, but the correlation remains.

Strategies to Reduce Greenhouse Gas Emissions

In December 2004, the Governors Locke announced a series of recommendations to combat global warming. The proposed legislation includes:

- Adopting the California vehicle emissions standards for new cars beginning with the 2009 model year and with the objective of reducing greenhouse-gas emissions from new vehicles by 30% by the 2016 model year.
- An energy portfolio bill that will include both renewable and energy-efficiency portfolio requirements for utilities;
- Adopting greenhouse-gas reduction goals for our state and establishing a greenhouse-gas emission registry and market development strategies; and
- Establishing state energy efficiency standards for 13 commercial and industrial products.

In addition to Governor Locke's proposed legislation two detailed assessments have been undertaken in Washington State and by the West Coast states to evaluate strategies to reduce greenhouse gas emissions. The assessments include work done by the Climate Protection Advisory Committee[6] (CPAC) and the Tellus Institute for the West Coast Governors' Global Warming Initiative (GWI). Both of these efforts examined multiple strategies for reducing greenhouse gas emissions, and the potential costs and savings from these strategies. The reports and additional information from these two greenhouse gas reduction strategy assessments can be found at:

1. Climate Protection Advisory Committee
   http://www.pscleanair.org/specprog/globclim/cpsp/index.shtml

2. West Coast Governors' Global Warming Initiative: *Ten Greenhouse Gas Reduction Strategies for The West Coast.*
   http://www.ef.org/westcoastclimate/

The CPAC assessment process included a broad range of contributors with participants several key industries, state and local government, public interest groups and academia. The assessment focused on the four counties (Snohomish, Pierce, King and Kitsap) that are regulated by the Puget Sound Clean Air Agency (PSCAA). These four counties are responsible for just under 50 percent of Washington states' greenhouse gas emissions. Table 1 below illustrates the greenhouse gas emissions reductions and costs for the seven strategies that CPAC examined.

[6] Sponsored by the Puget Sound Clean Air Agency.

Draft Report Table 2 and Figure G, revised to include Waste Management Savings

Summary of Strategy Costs and Emission Savings.

Strategies	GHG Savings (MMTCO2e)		Net Costs (million 2002$)		
	2010	2020	2010	2020	NPV 2005-2020[1]
Priority Rec One: Develop and adopt a climate change policy framework					
Emissions Trading (Cap and Trade)	0.2	0.8	16.6	4.1	18.0
Priority Rec Two: Increase the efficiency of energy use					
Full, sustained efficiency programs, building codes, and appliance standards	1.4	3.5	($55)	($137)	($707)
Other strategies to increase efficiency, improve design, and reduce emissions	0.7	1.8	$17 to ($5)	$32 to ($11)	$204 to ($66)
Priority Rec Three: Expand the contribution of renewable energy in the region's power mix.					
Renewables Portfolio Standard[2]	0.6	1.9	$16 to ($1)	$33 to ($33)	$171 to ($72)
Priority Rec Four: Increase the number of clean and efficient motor vehicles					
Adopt California standards (LEV II and Pavley)	0.2	3.1	($10)	($439)	($1,171)
Other Transportation Strategies[2]	0.1	0.1	---------- not estimated ----------		
Priority Rec Five: Reduce the number of miles traveled by motor vehicles					
Location-efficient plans, transit, and demand-side measures	0.5	1.6	---------- not estimated ----------		
Priority Rec Six: Protect natural landscapes and forest biomass					
Landscape Protection[3]	0.8	0.8	$6 to ($6)	$6 to ($6)	$59 to ($59)
Other AFSW Strategies[2]	0.9	2.0	$0.1	$0.1	$1
Priority Rec Seven: Encourage communities to actively manage and reduce the waste they produce					
Recycling and waste reduction	0.6	1.0	---------- not estimated ----------		
Total	6.0	16.6	($9) to ($60)	($501) to ($621)	($1,425) to ($2,056)

Figure 5. Summary of Strategy Costs and Emission Savings

The greenhouse gas emission reductions from these strategies were assessed at 6.0 and 16.6 million tons of CO_2 (equivalent) from baseline projections for 2010 and 2020 respectively in the four county region. The cost savings to residents and businesses in 2020, primarily from reduced expenditures for fuels and electricity, were estimated at 0.5 to 0.6 billion dollars, while cumulative 2005-2020 savings were estimated at 1.4 to 2.1 billion dollars[7]. Since the CPAC assessment covered a sub-region responsible for almost 50 percent of statewide greenhouse gas emissions, the statewide savings from the seven strategies above could be estimated at roughly twice the values cited in Table 1. Two strategies, the energy efficiency programs and the motor vehicle efficiency standards were forecast to be responsible for most of the total savings.

The Tellus Report *Ten Greenhouse Gas Reduction Strategies for The West Coast*, identified the following mitigation strategies for Washington, Oregon and California:

<u>Buildings and Industry Strategies</u>

1. Codes and standards
2. Efficiency programs
3. Industry carbon policy
4. Combined heat and power

<u>Electricity Supply Strategies</u>

1. Renewable portfolio standard
2. Electricity sector carbon policy

[7] Expressed as Net Present Value (NPV) 2004 dollars.

Transportation Strategies

1. Light duty vehicle standards
2. Vehicle mile traveled strategies
3. Freight strategies
4. Alternative fuel strategies

Tellus estimated that these ten strategies would reduce Washington State's greenhouse emissions by 7 and 31 million tons of CO_2 (equivalent) from baseline projections by 2010 and 2020 respectively. Most of these strategies were estimated to result in net savings, due to lower energy expenditures, for residents and businesses within the state. Net annual savings in 2020 were estimated at 1.8 billion dollars, while cumulative 2005-2020 NPV savings were estimated at 7.0 billion dollars.

As with the CPAC analysis energy efficiency programs and the motor vehicle efficiency standards were forecast to result in the greatest savings. The energy efficiency program strategy sets a target of achieving all cost effective gas and electric efficiency potential through a public benefits charge and/or an efficiency portfolio standard[8]. The light duty vehicle emission standard is similar to the Pavley standard recently developed in California[9], but goes a step beyond. The Tellus strategy set a target of a 30 percent reduction in new vehicle emissions of greenhouse gases by model year 2014, and a 50 percent emissions reduction for model year 2020.

[8] The Northwest Power and Conservation Council has conducted extensive research on the types and quantities of cost effective efficiency that can be realized in the Pacific Northwest.

[9] The California automotive emission standard, often referred to as the Pavley bill or standard after the bills sponsor, was developed by the California Air Resources Board to meet the requirements of Assembly Bill 1493 (2003). The standard stipulates approximately a 30 percent reduction in new vehicle emissions of greenhouse gases (tailpipe and air conditioning unit emissions) by model year 2016.

References

Kerstetter, J, *Greenhouse Gas Emissions in Washington State: Sources and Trends, Washington State Community*, Trade and Economic Development, Energy Policy Group, August 1999.

The IPCC Third Assessment Report: Climate Change 2001, is available at http://www.ipcc.ch/pub/reports.htm

The State and Local Climate Change program of the Environmental Protection Agency has an updated greenhouse gas inventory tool at http://www.epa.gov/globalwarming/greenhouse/greenhouse14/change.html

Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventory, IPCC National Greenhouse Gas Inventories Programme, ISBN 4-88788-000-6, 2001.

Biofuels Opportunities for Washington State Section 6

Northwest interest in biofuels is steadily growing. The need to diversify rural America, the growing desire to replace imported energy supplies and the need to reduce greenhouse gas emissions are generating strong interest in biofuel production and use. In 2003, the Washington legislature adopted a package of incentives to encourage the production and use of ethanol and biodiesel.[1] Several Washington state vehicle fleets are adding biodiesel mixes to their fuels to improve air quality and reduce greenhouse gas emissions. Companies are also exploring opportunities to start new biofuels businesses in the state.

The State of Washington and CTED are working with entrepreneurs, researchers, consumers, other governments, and the private sector to take advantage of these bioenergy opportunities. CTED's is working to build both the supply and the market for biofuels and bioproducts. In addition, the Department of Ecology is supportive of dairy and feedlot anaerobic digestion/biopower to solve a number of solid waste and water quality issues.

Among the various types of biofuels, biodiesel is generating particular interest because it is a fuel that can be produced from crops (such as canola and mustard seed) that grow well in Washington and the Northwest. Currently, ethanol - an oxygenate used in many state for Clean Air Act compliance and octane booster for gasoline - is primarily produced from Midwest corn crops. Efforts are underway to produce ethanol from cellulosic materials including agricultural residues such as wheat straw and timber thinnings – two feedstock that are abundant in Washington. A southern Idaho company, Logon, is developing a cellulosic ethanol plant. That plant may be a forerunner of opportunities in our state.

CTED is working on biofuels and other biomass products for several reasons. Turning biomass into bioenergy cash crops will help improve the competitiveness of Washington agriculture. Washington imports virtually all of our transportation fuels – an outflow from our state's economy of billions of dollars per year. Producing fuels within state will help diversify our energy supplies, support our rural economies, help to build new industries, and ultimately enhance our security. In addition, biodiesel use can improve air quality, reduce greenhouse gas emissions, and is less harmful than petroleum diesel if spilled.

The following section provides a brief background on biofuels, particularly biodiesel, opportunities in Washington. We begin with a description of biofuels and bioenergy and their uses. This is followed by more details on the policy and market forces driving interest in biofuels and a discussion of the factors necessary to make biofuels a viable industry. The final sections cover current markets and emerging suppliers. We conclude with an appendix of addition source information on biofuels organizations, regulations, and research efforts.

What are biofuels?

Biofuels (biomass fuels) are liquid fuels derived from biomass, such as oil seed crops, agricultural residue or timber wastes that can be burned in vehicles and motors. For biofuels to be economically viable in Washington it will be necessary to grow dedicated

[1] The legislative package included two bills that provided incentives for biodiesel and alcohol based fuels HB 1240 and HB 1241 and two bills that provided for biofuels demonstration projects HB 1242 and 1243.

crops, build crushers and processors or refineries. In addition, there are questions about how biofuels will integrate with our existing fuel supply infrastructure of refining, transporting, storage, and distribution systems.

Biodiesel is the fuel that is currently attracting the most demand and new supply interest. Biodiesel can be made from various crops with mustard and canola appearing to be the most economically viable in our climate and latitude. It can be used as a direct replacement for diesel fuel, B-100 (the designation used for a 100% biodiesel concentration) or in a conventional diesel blends most typically at 5, 10, 20% biodiesel (B-5, B-10, B20). Currently, most biodiesel is also made in the Midwest from soybeans and then shipped into Washington for wholesale and retail use. However, Washington has several strategic advantages over the Midwest in biodiesel production including:

1) Crops suitable to grow in Washington can produce more bio-oil feedstock per acre than soybeans; and

2) Local production does not carry the transportation costs of supply from the Midwest.

In addition to biodiesel, new technology has emerged to make ethanol from cellulose (grain chaff, timber residue, or other organic "waste" products). Nearly all of the more than 3 billion gallons of ethanol produced annually in the U.S. are made in the Midwest from corn. If this new technology proves economically attractive, Washington and the NW could become a supplier of ethanol not only to our state's refineries, which often use ethanol to boost gasoline octane, but also to large markets for fuel oxygenates in California.

Bioenergy and Other Uses

Biofuels are part of a larger grouping of bioenergy products. Bioenergy includes biofuels, biopower, and bioproducts that offset fossil energy or take significant energy to produce. Bioenergy feedstocks include trees, grasses, plant parts such as leaves, stems and twigs, ocean plants that contain stored energy, and yellow grease from animals and plants. During photosynthesis, plants combine carbon dioxide from the air and water to form carbohydrates, which form the building blocks of biomass. The solar energy that drives photosynthesis is stored in the chemical bonds of the structural components of organic materials. While the actual ratio of components varies among species, vegetable biomass averages 75% carbohydrates or sugars and 25% lignin.

If biomass is burned efficiently (which extracts the energy stored in the chemical bonds), then oxygen from the atmosphere combines with the carbon in plants to produce carbon dioxide and water. Bioenergy can produce electricity, heat, liquid fuels, gaseous fuels, and a variety of useful chemicals, including those currently manufactured from fossil fuels. Industry and agriculture need superior energy crops and cost-effective conversion technologies to expand bioenergy's use.

Biomass is available from various economic sectors- including agriculture, forest products, and construction - that dispose of large quantities of wood and plant products. Whether cultivated or growing wild, biomass represents a huge renewable energy opportunity.

"BioPower" systems generate electricity or industrial process heat and steam, such as from combined heat and power (CHP) systems. Wood waste is currently used to generate some heat and power. In Washington there are a number of wood processing facilities that use “waste” forest products to produce process steam and electricity in a boiler system.

The term “bioproducts" (biomass products) can be used to describe a chemical, material, or other product derived from renewable biomass resources. Often small quantities of bioproducts can have high market value as pharmaceutical, food additive, or chemically products. Because both biofuels and biopower must compete against relatively cheap fossil fuel sources at commodity prices, the additional revenue streams from high value bioproducts are often critical for economic success. Washington State University has a substantial research and development effort underway to produce these additional products (see below).

What are the drivers that make biofuels an attractive alternative?

There are many reasons interest in biofuels is increasing. A few examples are:

- Rising demand for petroleum worldwide (see section 5 for a description of the factors that are driving increased demand for petroleum.)
- Improved technologies for creating biofuels and bioproducts are decreasing costs, making use of new feedstocks, and improving the range of products produced
- New support for more secure domestic supplies of liquid fuels. The just released recommendations of the bipartisan National Commission on Energy Policy calls for a $1.5 billion effort over 10 years to “increase domestic production of advance non-petroleum transportation fuels from biomass (including waste.)”[2]
- Increased interest in diversifying rural areas and building local economies through value added agricultural products. This is in contrast to the marketing of commodity products – examples include food processing into frozen foods, using “waste materials” to produce energy, fertilizer or feed – because value added products are higher value, fill emerging niches are therefore more competitive and less subject to the price volatility of commodities.
- A growing desire for cleaner energy sources from the concerns surrounding reduction of greenhouse gases, improved air quality and the reduction of water quality problems for petroleum spills.

Key needs to build a biofuels/biodiesel industry in Washington

Since biofuels are relatively new to the northwest and there are many uncertainties they carry higher levels of risks. As consumers, entrepreneurs, investors, refiners, distributors, retailers, fleet managers, and growers become more familiar with the market, technologies, infrastructure, production and opportunities the climate is improving.

Washington State is working with many partners to nurture the overall supply chain and to solidify the value chain through technical assistance, loans, investments and

[2] National Commission on Energy Policy, *Ending the Energy Stalemate – A Bipartisan Strategy to Meet America’s Energy Challenges, Summary of Recommendations,* December 2004, p. 15.

research. CTED and its partners are working to address many of the following uncertainties to increase the likelihood of success.

- Growers are just beginning to raise energy crops – it takes experience and capital investment to achieve profitable yields and efficiencies – market demand exists, but market prices will take a while to solidify

    - An Oilseed Symposium is scheduled for February 10th in Spokane to discuss with farmers the opportunity and the elements of growing crops that can produce marketable biofuels.

- There are no oil crushers yet operating in Washington State – building and shaking down a new facility will take time and capital investment

    - New crushers are currently being explored. CTED has provided some initial funding for a crusher in eastern Washington, but it does not appear that that project will move forward at this time (early 2005)

- Liquid fuels are a commodity product; as such they compete based chiefly on price not on "amenity" value. Even with rising world oil prices, it can be difficult to make a commercial business case for biofuels unless secondary markets for the residual by-products are identified. For example, markets for the remaining oilseed crush or meal need to be established. For seed oil prices to be competitive it is vital that the remaining meal find value–added markets such as fertilizer, feed or bioproducts.

    - See the appendix, below for more details on research underway on value added products.

- Refiners and processing facilities need to be capitalized, designed, and built – biodiesel must compete in the marketplace

    - Projects are being explored with the first commercial scale processor going on line early in 2005

    a. The first commercial scale biodiesel plant in Washington is scheduled to begin production in early 2005. Seattle Biodiesel's processing facility is currently under construction in South Seattle. http://www.seattlebiodiesel.com/

- Transporting biomass is expensive. A WSU study showed that there is a large statewide resource of agricultural and forest biomass that could be converted to fuel. However, it also noted that the resource is expensive to collect and transport. Consequently, to make biofuels economic you typically need to also produce higher value products such as fuel, lubricants, fertilizer, or feed. Alternatively you need to have a large and concentrated feedstock available, such as waste wood at a lumber mill where transportation costs are less critical.
- Biofuels often have clean water clean air, and national security benefits that are not always reflected in their market value. However, it can often be difficult to acquire these benefits directly. The challenge is to find ways that these benefits can be reflected in the value of the products produced.

Washington markets for biodiesel are developing

King County, the City of Seattle and the Washington State Ferry system have committed to improving air quality by using biodiesel in their fleets. Seattle City Light has been helping to offset the higher cost of biodiesel to reduce carbon impacts and clean Puget Sound air. In total these markets will represent several hundred thousand gallons of annual demand. These markets are currently being served by fuel imported from the Midwest. Our goal is to begin to produce these supplies in Washington State and create a new industry for Washington.

http://www.metrokc.gov/kcdot/news/2003/nr031016_biodiesel.htm
http://www.ci.seattle.wa.us/light/conserve/globalwarming/#biodiesel

New Suppliers are emerging

- The first commercial scale biodiesel plant in Washington is scheduled to begin production in early 2005. Seattle Biodiesel's processing facility is currently under construction in South Seattle.
  http://www.seattlebiodiesel.com/

- The USDA funded a feasibility study to explore building a biorefinery in Columbia County in southeast Washington.
  http://www.harvestcleanenergy.org/enews/enews_1104/enews_1104_Biodiesel_Feasibility.htm

- Sustainable Systems Inc., based in Missoula, Montana, is exploring the building of a biorefinery in Washington State. The company has become a division of YaSheng Group, a worldwide company incorporated in Redwood City, California.
  http://www.nasdaq.com/asp/quotes_news.asp?cpath=20041201\ACQBIZ200412010600BIZWIRE_USPR____BW5284.htm&symbol=MBND%60&symbol=F%60&symbol=RLTR&symbol=YHGG&symbol=ICTN&symbol=NHCMF&selected=YHGG

- Almost 20 commercial outlets sell biodiesel in Washington State as tracked by the National Biodiesel Board.
  http://www.nbb.org/buyingbiodiesel/retailfuelingsites/showstate.asp?st=WA

Regulations and Incentives

The Puget Sound Clean Cities program tracks changing rules and incentives

Regulations
http://pugetsoundcleancities.org/State_Regulations.htm
Incentives
http://pugetsoundcleancities.org/State_Incentives.htm

Processing equipment

- Olympia Green Fuels of Olympia, Washington produces biodiesel processors. These are modular skid-mounted biodiesel processors capable of producing batches of biodiesel from (both waste and fresh) vegetable oil ranging from 25 Gallons (95

Liters) to 400 Gallons (1500 Liters) per batch. These processors will convert both fresh and waste vegetable oil into a washed and polished biodiesel capable of meeting ASTM standards.
http://www.olympiagreenfuels.com/

What is CTED doing to advance the biofuels industry?

CTED continues to work with consumers, entrepreneurs, growers, investors, fleet managers and government agencies to advance biofuels. Our focus has been to help create viable business models by

1. Reviewing business plans to ensure they are comprehensive
2. Connecting project sponsors to entrepreneurs and investors
3. Acting as an information clearinghouse on developments
4. Working with other state agencies to understanding permitting processes
5. Working with government agencies to identify funding sources
6. Working to strengthen the supply chain for biofuels to help overcome the chicken and egg problem

We will continue to identify places where we can help projects succeed and will work with a range of partners to advance the commercialization opportunity through market development, research, technical assistance and networking.

Additional Sources of Information on Biofuels

Governors Ethanol Coalition - Washington State is one of 29 member states. The CTED Energy Policy Division serves as the Governor's representative to the coalition.
http://www.ethanol-gec.org/

National Biodiesel Board - The National Biodiesel Board (NBB) is the national trade association representing the biodiesel industry as the coordinating body for research and development in the United States.
http://www.nbb.org/

WSU Energy Program - The WSU Energy Program is a self-supported department within the university's Extension Service. We receive project funding from federal government agencies, federal power marketing agencies, the nonprofit Northwest Energy Efficiency Alliance, and several other sources. WSU Extension Energy Program is the Project Leader for six states Pacific Regional Biomass Energy Partnership
http://www.energy.wsu.edu/

The Pacific Regional Biomass Energy Partnership - The Pacific Regional Biomass Energy Partnership is a regional effort that encourages the development of bioenergy in Alaska, Hawaii, Idaho, Montana, Oregon and Washington. It is supported by the U.S. Department of Energy and state energy offices.
http://www.pacificbiomass.org/

US Department of Energy – Energy Efficiency and Renewable Energy (EERE) - EERE administers energy efficiency and renewable research, demonstration and technical programs for the U. S. Government.
http://www.eere.energy.gov/consumerinfo/reading_resources/ta2.html

Puget Sound Clean Cities - The Puget Sound Clean Cities Coalition is a collaboration of public and private agencies and businesses working to promote the acquisition and use of alternative fuel vehicles and to create a network of alternative fuel facilities. The Coalition works in collaboration with the U.S. Department of Energy (DOE) and more than 80 other communities as part of the national Clean Cities Program. The goal of the Clean Cities Program is to reduce dependence on petroleum-based fuels in an effort to promote air quality, public health, energy security, and economic development. The Coalition provides information, technical assistance, access to grant funds, and other services to allow the implementation of alternative fuels programs in a cost-effective manner.
http://pugetsoundcleancities.org/

Harvesting Clean Energy - Harvesting Clean Energy is a regional partnership to build awareness of the benefits of renewable energy technologies for rural landowners and communities, and support implementation through technical and educational resources.
http://www.harvestcleanenergy.org/hce.html

Research - A range of research efforts are underway that the state is participating in:

Climate Friendly Farming Project - http://cff.wsu.edu/Project/

Bioenergy and Bioproduct Research and Outreach at Washington State University (see appendix for research summary)

Bioenergy and Bioproduct Research and Outreach at Washington State University

Bioenergy and Bioproducts Overview

National (Agricultural Research Center, WSU Extension Energy Program)
- Member of joint DOE/USDA Biomass Research and Development Technical Advisory Committee
- Member of National Biomass State and Regional Partnership Collaboration

Regional and State (WSU Extension Energy Program)
- Washington Project Leader for six state Pacific Regional Biomass Energy Partnership
- Maintain content rich regional bioenergy website http://www.pacificbiomass.org/
- Broad information about Washington's bioenergy status and activities
- Strategic Planning/Roadmapping
- Broad bioenergy and renewable energy expertise
- Center for Sustaining Agriculture and Natural Resources (CSANR) Climate Friendly Farming Project Website: http://cff.wsu.edu

Biofuels

Biodiesel (WSU Extension Energy Program, CSANR Climate Friendly Farming Project, USDA ARS)

- Oilseed cropping production potentials map for rain-fed agricultural region of Eastern Washington and Oregon
- Biofuel Variety Trials for irrigated production
- Biofuel Variety Trials for rain-fed production (esp. perennial crops)
- Community / Regional economic impact and benefit : cost analysis of emerging biofuel industry
- Technical, economic and policy analysis
- Outreach to farmers, communities, policy-makers, consumers on agricultural production of feedstock crops
- Assist both public and private sector groups interested in using/marketing biodiesel as a fuel
- Technical and programmatic assistance to the Puget Sound Clean Cities Coalition (market development)

Ethanol (WSU Extension Energy Program, Agri-environmental and Bioproducts Engineering Research Group - AEBE)

- Co-fermentation of C5, ligno-cellulosic sugars (wheat straw, paper pulp, etc.) for ethanol production
- Technical, economic and policy analysis
- Assist both public and private sector groups interested in using/marketing ethanol as a fuel.

Bioproducts (AEBE, CSANR Climate Friendly Farming Project)

- Omega 3 Fatty Acids from glycerin (waste product from biodiesel production)
- Chemicals from wheat straw (via waste products from ethanol production)
- Partnership development with Washington-based industry for commercialization of products

Biomass

Anaerobic Digestion (AD) (WSU Whatcom County Extension, (Agri-environmental and Bioproducts Engineering Research Group - AEBE), CSANR Climate Friendly Farming Project, WSU Extension Energy Program)

- Economic / technical evaluation and demonstration of a commercial-scale dairy anaerobic digester – state's first commercial dairy anaerobic digester operating via partnership with Darryl Vander Haak
- Basic research on performance improvements of the anaerobic digestion process
- Applied research and technology development on novel approaches and processes for anaerobic digestion for various scales and end-use applications
- Technology R & D for global application and adoption of "village-scale" AD, and associated technologies
- Technology assessment on various anaerobic digestion processes
- Economic and policy analysis on AD
- Community / Regional economic impact and benefit : cost analysis of emerging on-farm (AD) bioenergy industry
- Information, workshops, technical assistance, and outreach

Bioenergy Inventory Assessment (AEBE, WSU Extension Energy Program)

- A bioenergy inventory assessment has been completed for Eastern Washington
- Phase 2 of the assessment (Western Washington) has begun
- Wheat Straw for Ethanol Production: A Resource, Technical and Economic Assessment
- Logging and Agricultural Residue Supply Curves
- Washington Bioenergy Facilities Directory

Sustainable Waste to Energy Education and Technology Center SWEET (WSU Material Resources Management / Compost Facility, CSANR Climate Friendly Farming Project, AEBE, Veterinary Medicine)

- Development of a state of the art waste to energy technology center for waste management, research, teaching and outreach on the WSU campus.
- Comparative technical and economic evaluations of waste to energy technologies
- R & D on waste management for developing waste issues (i.e. infectious diseases / prions – "Mad Cow Disease" – from animal rendering, etc.)
- R & D on new, value-added products from waste materials

Bioproducts (AEBE, Climate Friendly Farming Project)

- Applied research and technology development on "co-products" from the anaerobic digestion process: i.e. high-value uses and processing of the digested fiber, nutrient extraction from the liquid effluent (slow release fertilizer)
- Nisin and Lactic Acid from cheese whey
- Chitosin and Lactic Acid from cull potatoes
- Partnership with Washington-based industry for commercialization of products
- Carbon credits and green tags/tariffs

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• Energy Efficiency, Codes/Standards, Market Transformation	Elizabeth Klumpp
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• Energy Information and Data	Greg Nothstein, Stacey Waterman-Hoey
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• Grants & Contracts, Petroleum Violation Escrow Funds	Cory Plantenberg
• Hydropower	Tim Stearns, Howard Schwartz
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• WA State Energy Strategy	Tony Usibelli, Howard Schwartz